R E P O R T   R E S U M E S

ED 003 150   64

A DEMONSTRATION OF THE USE OF SELF-INSTRUCTIONAL AND OTHER TEACHING TECHNIQUES FOR REMEDIAL INSTRUCTION OF LOW-ACHIEVING ADOLESCENTS IN READING AND MATHEMATICS, FINAL REPORT.

BY- HOMME, LLOYD E.
TMI INSTITUTE, ALBUQUERQUE, N.M.

REPORT NUMBER NDEA-VIIB-487   PUB DATE 13 AUG 65
CONTRACT OEC-4-16-033
EDRS PRICE MF-$0.18 HC-$4.72   118P.

DESCRIPTORS- *ACADEMIC PERFORMANCE, ACHIEVEMENT GAIN, *PROGRAMED INSTRUCTION, MOTIVATION, *LOW ACHIEVERS, *ADOLESCENTS, READING, MATHEMATICS, DEMONSTRATION PROGRAMS, *REMEDIAL INSTRUCTION, *INSTRUCTIONAL MATERIALS, *AUTOINSTRUCTIONAL AIDS, ALBUQUERQUE, NEW MEXICO

A DEMONSTRATION PROJECT WAS CONDUCTED (1) TO DEVELOP AND TEST A SYSTEM OF INSTRUCTIONAL MATERIALS INTENDED TO PROVIDE REMEDIAL INSTRUCTION IN READING AND MATHEMATICS FOR LOW-ACHIEVING ADOLESCENTS (2) TO DETERMINE THE EFFECTS OF SUCH A SYSTEM ON RETENTION AND JOB PERFORMANCE OVER A 6-MONTH PERIOD, (3) TO REVISE THE SYSTEM AND PREPARE AN INSTRUCTOR'S UTILIZATION MANUAL FOR ITS USE, AND FIELD TEST IT UNDER CONDITIONS OF USE, BOTH WITHIN AND OUTSIDE THE CONVENTIONAL SCHOOL SETTING, AND (4) TO MAKE FINAL RECOMMENDATIONS CONCERNING THE DEVELOPMENT AND USE OF INSTRUCTIONAL MATERIAL INTENDED FOR THE SCHOOL DROPOUT OR POTENTIAL DROPOUT, AND TO REVISE THE UTILIZATION MANUAL ON THE BASIS OF THE FIELD TESTING. THE PROJECT WAS CONDUCTED IN FOUR PHASES--(1) TEACHING, (2) RECORD-KEEPING, (3) FIELD TESTING, AND (4) DATA COLLECTION AND ANALYSIS. RESULTS SUFFICIENTLY CONFIRMED PROJECT EXPECTATIONS, AND FURTHER APPLICATIONS WERE RECOMMENDED. THE SYSTEM APPEARED TO PROVIDE A POSITIVE ATMOSPHERE FOR LOW ACHIEVERS THAT IS NECESSARY TO PRODUCE MOTIVATION FOR THE PURSUIT OF ACADEMIC GOALS. RESEARCH WAS RECOMMENDED IN TWO DIRECTIONS--(1) FURTHER REFINEMENT OF ADMINISTRATIVE TECHNIQUES TO REDUCE UNFAVORABLE TEACHER AND STUDENT ATTITUDES, AND (2) FURTHER RESEARCH INTO COMPONENTS OF THE SYSTEM ITSELF. AN INSTRUCTOR'S UTILIZATION MANUAL IS INCLUDED IN THE REPORT. (HB)

B-487

Draft of Final Report
Contract No. OE-4-16-033

TMI INSTITUTE

[illegible]

U. S. DEPARTMENT OF HEALTH, EDUCATION AND WELFARE
Office of Education
This document has been reproduced exactly as received from the person or organization originating it. Points of view or opinions stated do not necessarily represent official Office of Education position or policy.

Draft Copies

ED003150

PART I - Final Report

PART II - Instructor's Utilization Manual

Contractor: TMI Institute
213 San Pedro Drive NE
Albuquerque, New Mexico 87108

Contract No. OE-4-16-033

Project Title: A Demonstration of the Use of Self-Instructional and Other Teaching Techniques for Remedial Instruction of Low-Achieving Adolescents in Reading and Mathematics

Date: August 13, 1965

A DEMONSTRATION OF THE USE OF SELF-INSTRUCTIONAL AND OTHER TEACHING TECHNIQUES FOR REMEDIAL INSTRUCTION OF LOW-ACHIEVING ADOLESCENTS IN READING AND MATHEMATICS

Final Report

Submitted to

Media Research and Dissemination Branch
U. S. Office of Education
Department of Health, Education, and Welfare
Washington, D.C. 20202

Contract No. OE-4-16-033

by

Lloyd E. Homme, Ph.D.
Project Director

TMI Institute
213 San Pedro, NE
Albuquerque, New Mexico

CONTENTS

Page

INTRODUCTION 1
Problem and Objectives 1

DESCRIPTION OF THE PHASES 2
Phase I (Ten Weeks) 2
Phase II (Six Months) 2
Phase III (Six Months) 3
Phase IV (Three Months) 3

MOTIVATION: THE KEY TO SUCCESSFUL ADMINISTRATION IN THE INDIVIDUALIZED INSTRUCTIONAL CLASSROOM 4

PHASE I: THE PILOT PROJECT 7
Characteristics of the Students 7
Selection of Instructors 7
Classroom Operations 8
Programs and Materials 8
The Programed Lecture 10
The Programed Peer-Tutor Relationship 11
Student Morale 12
The Method 12
Results 13
Table I 14
Table II 14

PHASE II: THE FOLLOW-UP STUDIES 16
Conclusions 17
Comparison of Scores in TMI Institute Demonstration Project 18

PHASE III: FIELD TESTING 19
The Correctional School Project 19
Results 20
The Public High School Project 22
The Students 23
Materials Used at the Public High School 23
The Parochial High School 26
The Public High School In-School Demonstration 27
The Public High School In-School Demonstration, Pre-Post Test Gain Scores 28
The Parochial High School Demonstration, Pre-Post Test Scores and Differences 30
The Mountainair Job Corps Rural Center 31

CONTENTS

Page

PHASE IV: PREPARATION OF THE UTILIZATION MANUAL 33

SUMMARY AND RECOMMENDATIONS 34
The Initial Demonstration 34
The Public High School Project 35
The Mountainair Job Corps Center Project 35
Referral Students 35
Mean Gain in Grade Level for Successive Groups of Five Students Using Contingency Management Techniques 37
Pre-School Indian Project 38
Other Projects Which Have Employed the System 38
Inability to Explain the Contingency Management System 38
Initial Effort 40
Resistance to Change 40
Lack of Confidence 41
The Changing Teacher Role 41
Lack of Sufficient Instruction and Application 42
Final Recommendation 43

PART I

Final Report

A Demonstration of the Use of Self-Instructional and Other Teaching Techniques for Remedial Instruction of Low-Achieving Adolescents in Reading and Mathematics:

Final Report

INTRODUCTION

Problem and Objectives

It has become increasingly evident in recent years that the public schools of the United States are not successfully educating a relatively large number of young people. If our national goals are to be attained, it is imperative that education serve the "dropout," the culturally deprived, the academically unmotivated, and the economically disadvantaged.

The school must provide effective instruction for those who now seek to escape the classroom, but thus far no comprehensive solution to the problem of retaining and educating the dropout has been discovered. The major problem is first to provide needed and meaningful educational experiences for young people who have already fled the school; and, secondly, to develop techniques which can be applied in the school setting to provide diversified education intended to retain the potential dropout. The objectives of this demonstration were: 1. To develop and test, under parsimonious conditions, a system of extant instructional materials intended to provide remedial instruction in reading and mathematics for low-achieving adolescents. 2. To determine the effects of such a system on retention and job performance over a six-month period. 3. To revise the system and prepare an instructor's Utilization Manual for its use, and field test it under a number of conditions of use, both within and outside the conventional school setting. 4. To make final recommendations concerning the development and use of instructional material intended for the school dropout or potential dropout, and to revise the Utilization Manual on the basis of the field testing.

DESCRIPTION OF THE PHASES

Phase I (Ten Weeks)

In Phase I, the contractor recruited twenty-four non-reading adolescents for a six-week course employing individualized instructional material and collected data from current records on their achievement levels, abilities, and educational motivation. The contractor also recruited two persons to serve as tutors for the subjects. These tutors had no teaching experience and were not credentialed teachers.

The instructional system used in this phase consisted of currently available published and unpublished instructional materials, including self-instructional programs in phonetic reading, spelling, and reading comprehension. The students received instruction in mathematics and reading, integrated with practical and job oriented skills, such as change making, elementary measurement, and filling out of application forms.

At the end of the six-week training period, standardized achievement tests were administered to all subjects.

Phase II (Six Months)

During this phase, records were kept on all subjects who participated in the

Phase I pilot demonstration. At the end of the six-month period, a retention test was given and anecdotal and non-reactive records of the subjects' general behaviors were collected. These records were compiled and analyzed during the last two months of Phase II.

Phase III (Six Months)

This phase, run concurrently with Phase II, consisted of both in-school and out-of-school field tests of the instructional system, as formulated on the basis of experience in Phase I. One normal school project was conducted in a public secondary school, the other in a parochial secondary school. The projects conducted outside of normal schools were located in a Job Corps Rural Center and at a correctional institution.

Phase IV (Three Months)

In Phase IV, evidence collected from all previous phases was collated and analyzed. A thorough revision of the Utilization Manual was completed, including indications of the effectiveness of the material under differing conditions of use with subjects classified according to learning characteristics. The manual also includes citation of instructional materials, other than those used, which appear to hold promise of utility in similar programs.

MOTIVATION: THE KEY TO SUCCESSFUL ADMINISTRATION
IN THE INDIVIDUALIZED AUTO-INSTRUCTIONAL CLASSROOM

The establishment of sound, lasting student motivation is at once the most important and the most difficult step in building and applying an effective system of instruction. The initial student interest intrinsic in most programs often wanes after 300 or 400 frames. Full attainment of the learning objectives designed into any given program is very difficult unless proper motivation is provided.

Motivation is of utmost importance in all areas of education. *No matter how well-conceived, organized, and behaviorally sound a presentation may be, students will learn nothing from it unless they attend and respond.* Yet until now there existed *no* effective method of reliably producing student motivation. The importance of developing such a system cannot be overemphasized.

Motivation is often loosely termed the "energizer" of behavior. In employing such a definition, it is said that individuals are motivated to eat, to sleep, to make money, to be famous, etc. However, such a broad definition does not aid in determining which methods will maintain activity in classroom learning tasks. Therefore, it is necessary to limit this definition to a more specifiable condition. When an individual initiates and completes a given task, it might be said he has "task motivation." If the task is the construction of a retaining wall and the individual completes it, he has task motivation. If the task is completion of a page of graded reading material and the individual completes it satisfactorily, he has task motivation. Task motivation, then, is a descriptive, summarizing term for the complex of behaviors a student displays when he is attending to and responding appropriately to his given task assignment.

Task motivation is particularly important when programed course materials are used, since early courses ignored the problem of motivation. Generally speaking, programed instructional materials are published with no specific directions or recommendations to control motivation of the student using them. The learning results of these materials are generally good, but students often fail to complete them. This lack of task motivation may be observed in normal students with average motivation. The problem becomes critical when programed materials are used for potential high school dropouts, historically lacking self-motivation. If a student with average motivation has trouble completing a course, more difficulty can be expected in getting a non-motivated high school dropout to finish.

Although motivation is widely held to be a complex phenomenon, practical considerations of motivation can be reduced to one simple question: What reinforcers are available? Or, said another way, What events are available to motivate behavior? For everyday applications, it is not necessary to fully understand the operations of the complex phenomenon of motivation. It is only necessary to have a good idea of what events serve as motivators, so these events can be used to control the interest of the adolescents.

For behavior to be strengthened so that it will recur, it must be followed by some preferred consequence as reinforcement. Laboratory studies of reinforcement typically use the preferred consequence of eating or drinking to motivate animal behavior. Equivalent kinds of reinforcement can be used with children. However, it is awkward to use this kind of payoff for learning activities in the classroom. Students cannot be starved, nor can candy be placed in their mouths for correct responses. This creates the impossible position that rewarding consequences are necessary but impractical.

Those who will object to the simple treatment of behavior and reinforcement presented here may argue that human behavior is a highly complex affair involving much more than the simple matter of the consequences that behaviors produce. This may be a valid premise, but it surely is not a sound reason for ignoring the simple facts of life. Acceptance of the fact that human behavior is affected by individual emotions, ideas, hates, and loves, should not, as far as we can see, rule out also accepting the importance of the consequences of behavior.

The administrative techniques employed in all projects described herein have been centered around the concept of providing consequence for all learning activities. The resulting system has been termed "Contingency Management."

PHASE I: THE PILOT PROJECT

Characteristics of the Students

With the assistance of an Albuquerque Public School guidance counselor, the contractor recruited twenty-four non-reading adolescents. The guidance counselor is well-known and respected by his peers in the school system, and they were very cooperative in furnishing him with students. The majority of the students were Spanish-Americans. They ranged in age from fifteen to twenty. Most of the students were labeled by their teachers as unmotivated, troublesome, low achievers, having little ability or academic aspirations. Some of the adolescents had been in trouble with the police or had a record of minor disciplinary problems in their schools.

Mr. Hamrin, the guidance counselor, was responsible for pre-testing all of the students and interviewing them with questions regarding their scholastic history. Pre-test achievement scores (CAT, complete battery for grades 4-5-6, Form W) ranged from a grade level equivalent of 2.2 to 7.5 in reading, and from 3.4 to 7.6 in arithmetic (See Table 1, page 14).

Selection of Instructors

While the subjects were being recruited and the instructional materials collected, two persons were selected to serve as tutors. Neither had any classroom teaching experience, and both were college graduates. Both of them had previously been employed by TMI (Teaching Machines, Incorporated) and were conversant with behavioristic principles but not with conventional teaching theory or application.

Classroom Operations

Following the two-week training period for the tutors, classes were begun. The class met three hours a day for a period of six weeks. The students were divided into two groups of twelve, one group scheduled for the morning and the other for the afternoon. The classroom was physically located in the same building as the Institute. Desks and chairs were set up in this classroom and shelves were constructed for materials. Each group of students worked under the supervision of the tutor, but independently and at their own pace. Instruction in mathematics and reading was integrated, with emphasis being placed on practical and job oriented skills such as change making, elementary measurement, and how to fill out application forms.

The instructors had half a day to prepare for the three to three and one-half hours of instruction time for each group. Each day the instructor would make up an individual contingency contract for each student. Supplementary reading materials were selected and sometimes modified for the students. Magazine and newspaper articles on subjects such as new automobiles and surfing were rewritten to the grade level of the student. However, commercially available materials such as Reading Laboratories and Reading Comprehension programs were used for the major portion of instruction.

Programs and Materials

The following is a list of the programs and materials used in Phase I of this project:

1. Programs:

   a) Addition and Subtraction (Teaching Machines, Inc.)

   b) Multiplication and Division, Volumes 1 and 2 (Teaching Machines, Inc.)

   c) Decimals, Volumes 1 and 2 (Teaching Machines, Inc.)

   d) Fractions, Volumes 1 and 2 (Teaching Machines, Inc.)

   e) Spelling, Volumes 1, 2, and 3 (Teaching Machines, Inc.)

   f) Fractions (General Programmed Teaching Corporation)

   g) Fractions: Basic Operations (Teaching Machines, Inc.)

   h) General Science: Biology and Chemistry; Sound, Light, Electricity and Communications; Measurement, Meteorology, and Astronomy (Teaching Machines, Inc.)

   i) Physiology (Teaching Machines, Inc.)

   j) Ratios (Encyclopaedia Britannica Press--TEMAC)

   k) Russian, Volumes 1 and 2 (Teaching Machines, Inc.)

   l) Reading Laboratory 11b (Science Research Associates)

   m) Reading Comprehension (Teaching Machines, Inc.)

2. Additional Material:

   a) Sound the Word Exercises

   b) Puzzleboard

   c) The students were also allowed to bring in reading material of their own choice, such as sports and automotive magazines.

Educational methods and materials other than programed instruction employed in Phase I included the Programed Lecture and the Programed Peer-Tutor Relationship.

The Programed Lecture

During the first week of Phase I, the Programed Lecture was used to teach some basic concepts of Reading and Elementary Arithmetic.

The programed lecture technique, as its name indicates, is a direct outgrowth of programed instruction technique. However, there are differences, and these differences are extremely important.

In the programed lecture technique, the instructor, in his preparations, does not need to go beyond the analysis stage of programing. Once the subject matter is thoroughly analyzed and studied by the instructor, he is ready to enter the programed lecture situation. Student responses in the programed lecture situation are entirely of the critical discrimination type. That is, no direct responding takes place on the student's part, other than indicating the correct answer to several choices of possible responses, which are indicated on a blackboard. This is done by the color-card method. Different colors are learned to represent the four-choice possibilities: A, B, Both, and Neither, which indicate whether, in the choices provided, choice A, choice B, both choices, or neither choice is correct.

Our present evaluation of the programed lecture technique is that its effectiveness depends heavily on the extent and thoroughness of analysis performed prior to the lecture. Depending on the adequacy of the analysis, then, the programed lecture's effectiveness appears to fall somewhere between the conventional lecture and individual programed instruction. Its use is not recommended unless adequate time is allotted for analysis. If this is the case, programing the material is a small additional step that should be undertaken.

The Programed Peer-Tutor Relationship

A main goal of programed instruction is to permit each student to progress at his own rate. However, even an approximation of this is dearly paid for in administrative difficulties. This is true because of tremendous variations in the time required for students to complete a program. The problem becomes, really, "What is to be done with the students who have already finished, while the slower ones catch up?" If one considers a class of thirty or forty students finishing a program, or unit of a program, at thirty or forty different times, being ready for thirty or forty different kinds of enrichment material, one gets some notion of the monumental administrative problems involved. Simply keeping track of where each student is, to say nothing of what material he is ready for, and where it can be found, is a problem not to be taken lightly.

What is needed is a skillful tutor for every student, a tutor who can also take care of administrative details involved in getting a student through a program. This must be done at no additional expense. A solution to this seemingly impossible problem may lie in the possibility that the behavior of the students themselves can be so engineered as to provide each other with a private tutor. This relationship, which results when one student's behavior has been adequately engineered or programed so that he can function as a good private tutor for a peer, has been termed the Programed Peer-Tutor Relationship, or Programed PTR.

When a good Programed PTR has been established, the Peer-Tutor takes care of all the administrative chores. These are onerous when they come in overwhelming segments, but can be quite reinforcing when they concern only a single student. It is a different kind of event to assess the progress of a single student by grading one test than to assess the progress of a class by having to grade a stack of, say, thirty or forty tests.

The necessity for the use of other techniques, such as successive approximations, is minimized. The program makes the responses called for by the PT highly probable ones. If they are not, the PPTR system is revised so that the step which gives trouble is broken down into easier steps. However, in case the student is able to emit only an approximation of the response asked for, the PT knows enough to reinforce it as an approximation, rather than to punish the student for not giving it all.

During Phase I, the PPTR system worked well, even though the programing of it was of the most rudimentary sort. No unsatisfactory interpersonal relationships were observed in any Peer-Tutor Relationship.

Student Morale

Attendance records for the twenty-four students for the six weeks were impressive. After the first week of the six weeks' period, there was no absenteeism. There were also no disciplinary problems with these "troublesome" students. The absence of disciplinary problems was attributed to the fact that there was, from the beginning, no attempt to establish control through the use of punishment, or threats of punishment.

The Method

The main features of the method developed for this project can be best summarized as the result of combining programed instruction with the Premack principle (1959).

The Premack principle states that any lower probability behavior can be reinforced by following it with a higher-probability behavior. In order to exploit this principle of behavior, the instructors ascertained, through interviews, observation, and analysis of test performance, which of the available programs the student most wanted to go through and which the student thought he would dislike. The instructors then treated working on these programs as high and low probability behaviors, respectively. The Contingency Contract would demand some amount of low probability behavior before permitting time for a higher probability behavior. For example, instructions to the student might be: "Do ten pages in the Spelling program, then work on Russian for fifteen minutes." This example is not an imaginary one; two students did choose Russian as one of their high probability behaviors.

Obvious high probability behaviors included coke break, cigarette break, going to the bathroom, talking to friends, etc.

For a thorough discussion of the theoretical and experimental background of the Contingency Motivation System, see Section II of the Utilization Manual.

Results

At the end of the six weeks, all students were post-tested, using an alternate form of the California Achievement Test. The twenty-four students averaged a gain of five-tenths of one year in the six-weeks' period. In reading, one-third of the students showed a grade equivalent gain of a year or more. In arithmetic the gains were also gratifying, with one student showing a gain of 2.1 years.

Table I. California Achievement Test Pre-Post Grade Equivalents.

SUBJECT	READING			ARITHMETIC			LANGUAGE		
	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF
1.	5.5	6.7	1.2	7.6	7.4	-0.2	5.0	4.9	-0.1
2.	7.5	7.4	-0.1	7.3	7.0	-0.3	7.0	7.7	0.7
3.	2.8	4.4	1.6	5.7	6.0	0.3	3.9	4.8	0.9
4.	2.2	3.3	1.1	3.8	5.6	1.8	3.5	3.3	-0.2
5.	3.3	4.5	1.2	5.5	6.0	0.5	4.3	5.0	0.7
6.	7.2	7.0	-0.2	6.3	6.5	0.2	6.5	6.8	0.3
7.	2.4	3.7	1.3	4.6	5.0	0.4	3.8	4.4	0.6
8.	6.8	7.3	0.5	6.8	7.5	0.7	6.8	7.9	1.1
9.	4.2	4.5	0.3	7.0	7.3	0.3	5.6	5.6	0.0
10.	6.3	6.6	0.3	6.5	7.2	0.7	6.7	7.2	0.5
11.	7.3	7.6	0.3	7.1	7.3	0.2	6.8	7.5	0.7
12.	6.1	6.9	0.8	7.1	7.5	0.4	6.7	7.3	0.6
13.	6.1	7.1	1.0	6.3	6.6	0.3	6.1	6.7	0.6
14.	2.9	2.9	0.0	3.4	5.5	2.1	3.0	3.7	0.7
15.	4.4	3.2	-1.2	5.0	5.3	0.3	5.0	4.3	-0.7
16.	7.2	7.6	0.4	6.8	7.1	0.3	6.7	7.8	1.1
17.	4.0	5.2	1.2	4.1	4.0	-0.1	4.2	4.5	0.3
18.	7.2	7.7	0.5	6.7	7.4	0.7	6.8	7.9	1.1
19.	4.8	5.6	0.8	6.1	6.1	0.0	5.5	6.0	0.5
20.	5.9	6.0	0.1	5.8	6.6	0.8	6.1	6.3	0.2
21.	2.7	3.1	0.4	3.8	4.4	0.6	3.5	3.9	0.4
22.	5.1	5.4	0.3	7.4	8.3	0.9	6.0	6.9	0.9
23.	4.8	4.8	0.0	4.7	5.2	0.5	5.0	4.9	-0.1

Table II. Pre- and Post-Test Mean Scores on Reading, Arithmetic and Language Achievements, with Gain Values.

	READING		ARITHMETIC		LANGUAGE	
	PRE	POST	PRE	POST	PRE	POST
MEANS:	5.07	5.59	5.89	6.38	5.41	5.88
GAIN:	.52		.49		.47	

From a motivational standpoint, students generally completed more frames each day (as demanded by the contingency plan) than they had the preceding day, until at the end of the project, several students were completing over 600 frames per day. Part of the reason for this is that, unlike the conventional schools, where going home depends on elapsed time, the students were permitted to leave when they had worked their way through their contingency contracts. The instructor demanded more and more work each day, but the students managed to leave at about the same time each day, regardless.

When school began in the fall of 1964, except for two students who joined the Navy, all of the original demonstration group students, including one student who had previously dropped out of school, returned to school. Most of the students returned to Special Education classes and were in these classes at the time of the follow-up studies.

PHASE II: THE FOLLOW-UP STUDIES

While enrolled in the regular Special Education classes in the public school system during the six-month period of Phase II, the subject students achieved an average gain of one-tenth of a year in the areas of reading, arithmetic, and language. The average gain in these areas during the six-week demonstration project for the same students was one-half year.

Reports on the students gathered from teachers, other students, and parents were mostly favorable. Two parents voluntarily requested information regarding follow-on projects. Seven of the ten teachers and counselors contacted commented on the favorable personality changes which had taken place in their students. One boy who had dropped out of school before this demonstration returned to school, and one boy was taken out of Special Education classes and transferred back to regular classes.

Apparently success in the individualized instruction classroom had a positive effect on student attitude toward regular school work. Those students having poor prior school attendance records and who did make significant grade gains during the demonstration, had excellent post-demonstration school attendance records. Students who showed the greatest gains had better attendance records than the others, their grades were better, and they exhibited more positive attitudinal changes, according to reports of other students, teachers, and parents. On the other hand, students who did not achieve much during the demonstration continued to have poor attendance records. These students also continued to show relatively lower achievement, as measured by the California Achievement Test.

The tables on the following page show the pre-test level of the students, the amount of gain in the demonstration project, and the amount of gain after six months in school. The data include the areas of arithmetic, reading, and language and the mean gain scores for each area.

Conclusions

The ordinary high school Special Education curriculum to which this group of students was exposed was unable to produce more than one-fifth of a year grade gain for these students in an entire semester. This suggests that such classes do not provide student motivation nor sufficiently allow for differences in student abilities and interests. Individualized instruction is specifically designed to take into consideration differences in student factors. Individualized instruction, therefore, does appear to be a superior method for teaching the low achiever in a high school setting.

Since the contingency management system was able to maintain interest as indicated by the high performance rates and attendance records, it appears that an individualized instruction system consisting of a combination of programed instruction and the application of contingency management technique is an effective system. The data support the contention that under such conditions, the dropout can learn five to ten times as much in a six-week period than he could during a full semester of Special Education as now conducted in the high schools.

Comparison of Scores in TMI Institute Demonstration Project

	Table I			Table II			Table III		
	READING			ARITHMETIC			LANGUAGE		
SUBJECT	Initial Level Pre-Test	Institute Gain Pre-Post Dif.	School Gain Post-6 Mo. Dif.	Initial Level Pre-Test	Institute Gain Pre-Post Dif.	School Gain Post-6 Mo. Dif.	Initial Level Pre-Test	Institute Gain Pre-Test Dif.	School Gain Post-6 Mo. Dif.
1.	7.5	- .1	- .3	7.3	- .3	+ .2	7.8	+ .9	-1.8
2.	2.2	+1.1	+ .3	3.8	+1.8	- .5	3.5	- .2	+ .8
3.	3.3	+1.2	+ .3	5.5	+ .5	+ .1	3.9	+ .2	+ .9
4.	7.2	- .2	+ .4	6.3	+ .2	+ .2	6.5	+ .3	- .4
5.	2.4	+1.3	0	4.6	+ .4	- .2	4.5	- .1	- .4
6.	6.8	+ .5	+ .4	6.8	+ .7	+ .2	7.2	+1.7	-1.1
7.	4.2	+ .3	0	7.0	+ .3	+ .4	4.8	- .4	+ .7
8.	6.3	+ .3	0	6.5	+ .7	+ .4	7.9	- .3	- .7
9.	6.1	+ .8	+ .4	7.1	+ .4	+ .6	6.8	+ .4	- .4
10.	6.1	+1.0	+ .2	6.3	+ .3	+ .4	6.0	+ .5	- .1
11.	2.9	0	+ .1	3.4	+2.1	-1.7	3.0	+ .7	+ .2
12.	4.4	-1.2	+2.0	5.0	+ .3	+ .4	4.9	- .8	+1.6
13.	7.2	+ .4	- .6	6.8	+ .3	+ .6	6.4	+2.2	-1.4
14.	4.0	+1.2	0	4.1	- .1	+ .6	4.2	+ .1	+ .4
15.	7.2	+ .5	+ .2	6.7	+ .7	+ .5	7.7	+ .9	-1.4
16.	4.8	+ .8	- .8	6.1	0	+ .4	5.4	+ .7	- .3
17.	5.9	+ .1	+ .4	6.1	+ .5	+ .1	6.4	- .2	+ .3
18.	2.7	+ .4	+ .6	3.8	+ .6	- .8	3.5	+ .5	- .3
19.	5.1	+ .3	+1.2	7.4	+ .9	- .1	6.0	+ .9	- .8
Average Gain		.45	.25	Average Gain	.54	.09	Average Gain	.42	-.22

PHASE III: FIELD TESTING

Phase III consisted of field tests of the instructional system in both school and out-of-school settings. The system was amended on the basis of experience obtained in the Phase I pilot project. Two separate school settings were selected in which the instructional system was used with potential dropouts under the supervision of qualified school personnel. These two settings were a Special Education class at public high school and a Remedial Class at a parochial high school. The public high school project began on February 4, 1965, and was scheduled to conclude on March 29, 1965. However, at the request of the teacher, the demonstration was allowed to continue until April 16, 1965. The parochial high school project began on March 29, 1965, and concluded on May 14, 1965.

The out-of-school demonstration projects were conducted at the Mountainair Job Corps Center and at a correctional school. The Mountainair project began on April 13, 1965, and was concluded July 16, 1965. The correctional school project ran from October 5 through December 18, 1964.

The Correctional School Project

All students at the correctional school are there because of a court order, generally issued as a result of a relatively minor violation. The school is located on the same grounds as the detention home. More serious violations result in sentencing to the state correctional school.

A principal and four classroom teachers constitute the staff. Although the staff is paid and regulated by the Board of Education of Albuquerque, New Mexico, the setting is definitely not that of a normal school.

Orientation for the teachers consisted of three one-half-hour sessions. Since the Utilization Manual had not yet been prepared, each teacher was given a copy of Technical Progress Report No. 1. These teacher orientation sessions did not go well and, as a result, later teacher cooperation was less than optimum.

Results

If one considers only the progress made in changing the teachers' attitudes, or in imparting the knowledge of the system necessary for effective program administration, then the demonstration failed. But in two important areas it succeeded. The demonstration proved that the system is practical in a school setting if properly administered, and much insight was gained into the problems of communication with teachers.

There were three main reasons for failure:

1. The systems were not made explicit enough to the teaching staff.
2. The classroom conditions necessary to allow the system to succeed were not firmly established.
3. The staff was not sufficiently convinced of the need to use the precisely prescribed methods in all aspects of their interactions with the students.

For these reasons, the demonstration was not properly controlled and operated under highly compromised conditions. Instead of the proposed individual instructional system, the staff was forced to use an ill-conceived adaptation of lockstep group instruction.

1. Communication

At the correctional school, the nature of programed instruction was not communicated. The goals and the means to reach these goals were not explained. To further compound this failure, the principal and the faculty were unable to understand, and, therefore, unable to use, the principles of contingency management set forth in the initial orientation. Since use of these principles in conjunction with programed administration is the heart of the system that was being tested in the correctional school setting, any attempts to apply the method without complete understanding could only result in an ineffectual presentation.

One of the reasons for the failure in communication can be attributed to the type of school setting. Since this was a correctional institution, it was not possible to persuade the staff of the necessity of the use of positive consequences in activity management. The teachers had been working for some time with juvenile delinquents, and, as a result, believed punishment to be the only effective means of control. The instructors were even heard verbally punishing the students by shouting, by threatening, or by lecturing them.

2. Failure to establish ideal conditions

Individual and collective duties, responsibilities, and authorities were not made clear to all those concerned. As a result, ultimate control authority was never clearly established. The school principal and staff accepted no responsibility for proper conduct of the experiment, yet suggestions for its success were seldom followed or even allowed.

Most suggestions made to the school staff during the course of the experiment were politely refused. When it was suggested that all experimental students be located in one class so one teacher could be responsible for them, the response was negative. When it was appropriate to introduce the contract into the classroom, the principal politely vetoed the idea. As a consequence, the experiment was, of necessity, conducted in an imprecise and makeshift manner.

3. Problems in teacher-student interaction

The school staff was not persuaded to adopt the techniques of contingency management in their interactions with students. When the idea of using motivational procedures in conjunction with mathematics programs was broached, it was turned down. The staff held the firm opinion that only mathematics should be taught in mathematics classes; only punctuation in punctuation classes; and only reading in reading classes. Consequently, it was not possible to schedule a significant percentage of the programs provided. In a one hour mathematics class, students were expected to work on mathematics programs for the full hour, as in any conventional approach. Naturally, most students quickly tired of their programs. They soon discriminated that there were no consequences for diligent application. The students were content merely to sit in their chairs, occasionally talking with their neighbors. Toward the end of the experiment, some students refused to do even a single frame. Because it was not possible to employ the proposed system in the experiment, it was not considered of any value to obtain post-test data on the students.

The Public High School Project

A rough draft version of the Utilization Manual was employed in initiating the public high school project. The Special Education teacher at the school admittedly found the techniques and principles of the manual somewhat difficult to administer at first, but continuing use greatly facilitated their application.

The Students

There were thirteen students in the demonstration project, all low-achieving adolescents who required remedial instruction in reading and mathematics. Pre-tests employing the California Achievement Tests indicated these students had approximately the same profiles as those of the pilot demonstration. Average reading level and average mathematical ability were approximately third-grade level. The students had been classified by school officials as educationally, culturally, or mentally retarded.

Materials Used at the Public High School

The following programed materials were used by the high school students:

Basic Electricity	2
General Science	2
Work and Machines	1
Sound, Light and Electricity	1
Spelling (Volume I) (Diagnostic Tests for Spelling)	5
How to Watch a Football Game	2
Basic Reading I	5
Basic Reading II	5

Reading Discrimination	4
Reading Comprehension (Reading Comprehension Progress Checks)	4
Reading Laboratory	1
Fractions (Fractions Progress Checks)	8
Decimals (Decimals Progress Checks)	12
Punctuation	9

After the introductory phase, the teacher reported the effort required to administer the system was greatly decreased, and the system soon operated smoothly and efficiently. The teacher kept a weekly log which indicates that as he became acclimated to the system, it worked increasingly better. Following are excerpts from this log.

> 2-26-65 Continued starting programs. Started C. G., R. B., and L. T. Fixed up contract file and got progress checks for Fractions and Decimals. Received first day check sheet. (Have made some mistakes that would not have been made if received sooner.)
>
> 2-27-65 Started a couple more programs. Class members who have not started yet were restive. Should have started more of the class (faster rate of introduction). Seems to be well received so far. Started J. C. and L. S.
>
> 3-1-65 All students started. J. A. shows former attitudes. He cannot be disciplined to do the assigned program in the proper order. R. F. did not work very well. He does not, historically, work well in a permissive situation. Have started using World Book Cyclo-Teacher as preferred consequence. This is followed by discussion with teacher, and seems to be a fairly good preferred event.
>
> 3-2-65 School administrators entered the room at a time when discipline was very lax. Problem here is setting up the contracts so the time is filled until the end of school.

3-3-65 At the request of the school supervisors, the teacher discipline became authoritative. This change in discipline method did not noticeably affect the programs. Teacher made the mistake of thinking the programed method demanded a great amount of permissiveness.

3-4-65 Am running into trouble with the students keeping their own place in the program.

3-9-65 Am having trouble with the progress checks. Administration of them is difficult. With better reference to them in the program, this would cease. Why don't programs contain directions to the student as to when he needs a progress check? This might make the progress checks more reinforcing and put them on a preferred event level.

3-12-65 Programs used for two hours today. Caught a couple of the students cheating. When told that if they could not pass the progress check, they would have to redo the necessary section of the program, was told they would refuse to do this.

3-15-65 The Reading Comprehension program seems to be the most popular.

Near the end of the project, the teacher indicated that the system was working so well that an extension of the original demonstration period would be desirable. The system was continued in use until the end of the semester, the teacher commenting several times on how well the students were doing in comparison to their performances prior to the introduction of the Contingency Management System.

Three of the original students dropped out of the program. The teacher stated that this was not due to dislike of the system, but to financial burdens of the respective families. Students who dropped out did so in order to obtain employment for purposes of aiding their families.

The teacher's comments and daily logs were very helpful in evaluating and revising the manual.

At the termination of the project, the teacher stated that the students had learned at least twice or three times as much as they ordinarily would have learned.

Pre- and post-testing with standardized achievement tests indicated that the average academic gain in overall performance was .6 of a year. The average student in the group gained .4 of a year in reading, .6 of a year in mathematics, and .7 of a year in language.

The table on page 27 shows the pre- and post-test scores for each student and the mean scores in reading vocabulary and comprehension, arithmetic fundamentals and reasoning, and language mechanics and spelling. The pre-test was on California Achievement Test Form W for grades 4-5-6 and the post-test on Form Z for grades 4-5-6.

The table on page 28 shows the gain scores for each student and the mean scores for all students.

The Parochial High School

The Utilization Manual, as it appeared in the Appendix of Technical Progress Report No. 2, was modified and given to the remedial reading teacher at the parochial school. This in-school project began on March 29, 1965, and ended on May 14, 1965.

There were nine students in this demonstration project, five girls and four boys. The group was classified by the school officials as low-achieving adolescents requiring remedial instruction in reading and arithmetic.

The pre-tests (CAT) showed an average reading level of seventh grade, and an average language level of seventh grade. This was considerably higher than the initial pilot demonstration, the public high school, or the correctional school student populations.

THE PUBLIC HIGH SCHOOL IN-SCHOOL DEMONSTRATION

	READING		ARITHMETIC		LANGUAGE	
	Vocabulary	Comprehension	Reasoning	Fundamentals	Mechanics	Spelling
PRE-PROGRAM TEST (CAT Form W 4-5-6)						
1. JA	5.8	4.6	4.9	3.4	3.9	3.8
2. RB	4.5	2.5	2.9	5.3	3.6	5.9
3. JDC	5.6	5.0	3.9	6.0	5.0	5.6
4. RF	5.6	4.1	4.2	5.6	4.2	5.0
5. CG	2.8	2.8	2.7	5.2	3.9	3.3
6. LJ	3.8	2.6	3.6	4.8	3.2	2.4
7. JL	3.3	2.7	3.4	3.9	3.7	2.7
8. CM	4.9	4.8	3.3	3.8	4.0	4.8
9. FM	4.5	5.7	4.7	4.7	4.5	5.0
10. LT	5.3	5.7	6.5	6.7	5.1	5.0
Mean Score:	4.6	4.0	4.0	4.9	4.1	4.4
POST-PROGRAM TEST (CAT Form Z 4-5-6)						
1. JA	5.9	5.2	4.7	5.7	5.5	6.8
2. RB	4.9	4.9	3.5	4.4	4.3	5.3
3. JDC	5.6	5.4	5.5	6.1	5.3	5.6
4. RF	5.6	5.7	5.7	6.0	4.5	6.2
5. CG	2.4	3.3	3.8	6.1	4.5	4.3
6. LJ	3.3	3.2	3.3	4.8	3.6	3.0
7. JL	3.7	2.8	3.6	5.2	4.0	2.1
8. CM	5.4	5.0	4.7	4.8	5.1	5.9
9. FM	5.4	4.7	5.3	5.1	5.5	5.3
10. LT	5.9	5.6	7.1	7.3	5.4	5.6
Mean Score:	4.8	4.6	4.7	5.5	4.8	5.0

THE PUBLIC HIGH SCHOOL IN-SCHOOL DEMONSTRATION

PRE-POST TEST GAIN SCORES

	READING		ARITHMETIC		LANGUAGE	
	Vocabulary	Comprehension	Reasoning	Fundamentals	Mechanics	Spelling
1.	.1	.6	- .2	2.3	1.6	3.0
2.	.4	2.4	.6	- .9	.7	- .6
3.	0	.4	1.6	.1	.3	0
4.	0	1.6	1.5	.4	.3	1.2
5.	- .4	.5	1.1	.9	.6	1.0
6.	- .5	.4	- .3	0	.4	.6
7.	.4	.1	.2	1.3	.3	.6
8.	.5	.2	1.4	1.0	1.1	1.1
9.	.9	-1.0	.6	.4	1.0	.3
10.	.6	- .1	.6	.6	.3	.6
Total	2.0	5.1	7.1	5.9	6.6	7.9
Mean Score:	.20	.51	.71	.59	.66	.79

The same materials were used in the parochial high school project as were used at the public high school, differing only in the quantities of certain programs required in order to accommodate individual student requirements.

The teacher had one-half year of previous experience in teaching remedial reading. In this demonstration, it soon became evident that the manual was not written clearly enough for full understanding and utilization. The system as presented in the manual was not clear enough and was considered unacceptably unorthodox by the teacher, who also felt pressured into cooperating with the project. The students, unfortunately, were not informed of the nature of the project, but were taken out of regular classes and made to feel like failures, being punished for their poor performance in regular class.

The teacher's resentment of the system was openly expressed to the students, soon convincing them that the techniques were ridiculous. Students were heard to express the sentiment that the work was "baby work." One student became sick after a very short period and did not return to the program; another had been taken from the only class in which she was maintaining an A average, causing natural resentment of the techniques and systems being used. This particular student had a past history of absences which continued for the remainder of the project. The student also did not take the post-test.

Since the project was going so badly, the teacher agreed to let members of the TMI Institute staff operate the class for one week to determine if the system was practical with this population. Within three days the system was running very smoothly. Unfortunately, the obvious results further alienated the instructor.

The results were generally not favorable. The table on page 30 shows the differ-

THE PAROCHIAL HIGH SCHOOL DEMONSTRATION

PRE-POST TEST SCORES AND DIFFERENCES

	READING			ARITHMETIC			LANGUAGE			TOTAL		
	Pre	Post	Diff.	Pre	Post	Diff.	Pre	Post	Diff.	Pre	Post	Diff.
IQ	3.7	4.5	+ .8	6.0	6.5	+ .5	5.8	6.8	+1.0	5.3	6.0	+ .7
LB	6.4	6.6	+ .2	6.4	6.9	+ .5	6.2	6.3	+ .1	6.0	6.6	+ .6
DL	6.5	6.4	- .1	6.9	6.9	0	7.3	8.0	+ .7	6.9	7.1	+ .2
JB	7.1	6.4	- .7	8.3	8.8	+ .5	7.0	7.5	+ .5	7.6	7.7	+ .1
TM	7.6	8.8	+1.2	8.3	8.0	- .3	7.4	7.8	+ .4	7.9	8.4	+ .5
Average Gain:			+ .28			+ .24			+ .52			+ .42

ences in pre- and post-test scores for reading, arithmetic, and vocabulary. The mean gain in reading was .28 grade level; in arithmetic, .24 grade level; in language skills, .52 grade level; and total score, .42 grade level. The pre-test was on California Achievement Test Form X for grades 7-8-9 and the post-test on Form W for grades 7-8-9.

The Mountainair Job Corps Rural Center

A revised copy of the manual was given to the educational director of the Mountainair Job Corps Center. The students at Mountainair were typical of those entering Job Corps camps throughout the United States. Although the teacher agreed to begin on the project as soon as possible, the Center was in the process of organization and receiving students, and immediate initiation of a classroom-wide program was not feasible. Instead, the teacher began with only one student.

The test student arrived at the Job Corps Center on April 13, 1965. Job Corps diagnostic tests placed the student just beyond the most elementary level. For six two-hour sessions, the student worked on Program VI, reading an average of twenty-four pages per session. After the student was placed under contract, he was reading an average of thirty-four pages per session, never scoring lower than 84% on progress checks. On twenty-nine of thirty-six tests, his score was 100%.

A few weeks later, the teacher started a second student. This student, placed immediately on the contingency management system, averaged completion of ten selections per day. The daily number of selections read increased with each two-hour session. Six selections were read at the first session and fifteen selections at the last session.

A third student who was phased into the system was severed from the Job Corps Center before any conclusions could be drawn.

Near the end of July, the educational director of the Center contacted the principal investigator, stating that the contingency management system had created a favorable impression and that the Center wished to continue its use. It was also indicated that four Corpsmen from the Mountainair Center would be in the city of Albuquerque for several weeks and the teaching staff of the Center would like these four students to continue their schooling under direction of the TMI Institute system.

PHASE IV: PREPARATION OF THE UTILIZATION MANUAL

The first draft of the Utilization Manual was begun after the pilot project had ended. Specific sections of the manual were assigned to individual staff members, each of whom based his writing on experiences gained from the pilot project. After all sections had been written, a single editor rewrote and consolidated them to ensure unity and consistency.

The manual was still in preparation when the correctional school project began, so it could not be tested directly. However, experiences resulting from this project were used in revising the initial draft.

The revised first draft was then given to a teacher at a public high school, who intended to employ the system in the classroom. The teacher's comments and suggestions were solicited and incorporated, where valid, into a second revision of the manual.

This newly revised draft was given to the teachers involved in the parochial high school and Job Corps Center demonstrations to determine the manual's utility and ease of administration. Both projects indicated satisfactory results from use of the manual.

A final behavioral edit was undertaken to ensure that the behavioral material in the manual is factual and that there are no errors in terminology.

SUMMARY AND RECOMMENDATIONS

The demonstration of the Contingency Management System can be termed a success because it indicated the feasibility of an administrative and motivational system for individualized instruction employing programed materials designed especially for low-achieving adolescents. Specific successes occurred when the investigators achieved sufficient control of the classroom situation to ensure proper implementation of the system. The demonstration failed when proper implementation was not accomplished. These failures are not attributable to the system itself, but to inadequate communication with responsible school officials.

In addition to the successes achieved in the course of this project, the results of several independent investigations emphasize the effectiveness of a properly applied system of contingency management. Some of those demonstrations are discussed below.

The Initial Demonstration

The initial in-house study indicated substantial gains in achievement and student morale. The instructors used in this demonstration, although untrained in educational methods, performed quite capably as teachers. It may, indeed, have been this very lack of previous experience which accounted for the instructors' willingness to accept and employ the suggested principles and technology, some of which appear to disagree with current educational practices.

The Public High School Project

The public high school project was a success, due largely to the complete cooperation of the teacher assigned by the school system. Sincerely interested in helping his students, the Special Education teacher welcomed any techniques offering an improvement in methods and results. Teacher and student reaction to the system was most positive and gratifying, as indicated by the voluntarily expressed desire to continue the system after completion of the demonstration. The achievement gains, although not as high as hoped for, were substantially in excess of what the teacher would have predicted for the same student group being taught by conventional techniques.

The Mountainair Job Corps Center Project

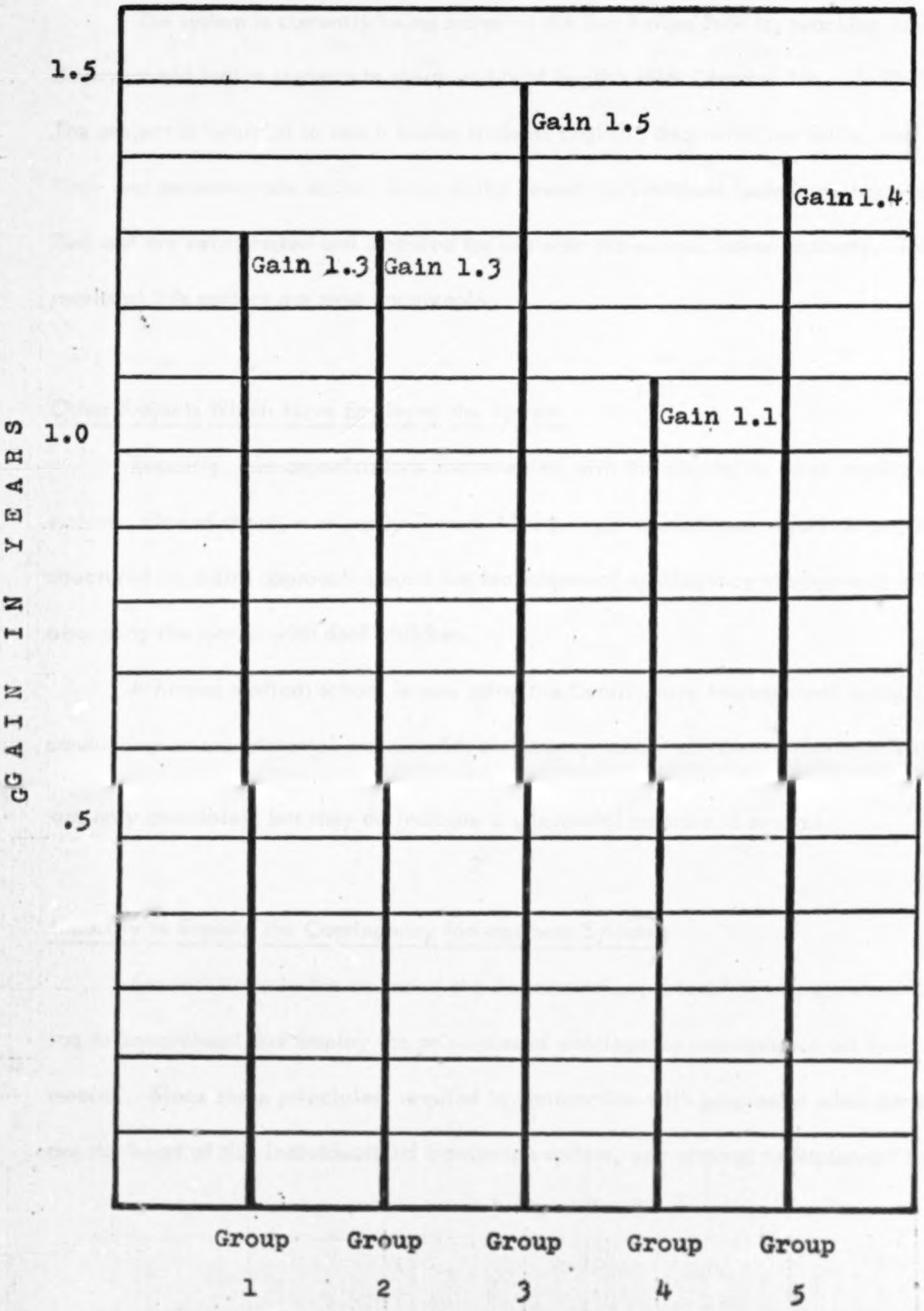
In the Mountainair Job Corps Center, it was not possible to use the system with an entire class. However, in testing the system on two boys, the camp educational director reported both boys learned very well and enjoyed the experience. The results were so satisfactory that it is planned to continue and expand the use of the Contingency Management System at the Center.

Referral Students

For almost a year, former staff members of the contractor have been working with referral students having a variety of educational deficiencies. Since December, 1964, all referral students, ranging in age from three to twenty-eight, have been using the Contingency Management System. Results have been excellent, both in terms of achievement and student morale. Students who had "mental blocks" in subjects such as arithmetic and spelling needed only some additional external incentive to again attempt to learn. The contingency contract provided such incentive.

The following chart shows the mean grade level gain in years for five groups of five students using contingency management procedures. The smallest gain is 1.1 years, and the largest gain is 1.5 years. The average length of time to achieve the gains was approximately twelve weeks. All tests were standardized.

MEAN GAIN IN GRADE LEVEL FOR SUCCESSIVE GROUPS OF FIVE STUDENTS USING CONTINGENCY MANAGEMENT TECHNIQUES



Pre-School Indian Project

The system is currently being tested at the San Felipe Pueblo, teaching four- and five-year old Indian students to speak and read English (BIA Contract No. 14-20-0650-1506). The project is intended to teach Indian students English, discrimination skills, and general first- and second-grade skills. Some of the newest motivational techniques have been codified and are being tested and modified for use with pre-school Indian students. The initial results of this project are most encouraging.

Other Projects Which Have Employed the System

Recently, two organizations unconnected with the contractor have employed the system. One of these, a recently-formed Albuquerque educational organization, has structured its entire approach around the techniques of contingency management and is also using the system with deaf children.

A Kansas medical school is now using the Contingency Management System in conducting an experimental project with elementary school children. The reports so far are only anecdotal, but they do indicate a substantial measure of success.

Inability to Explain the Contingency Management System

Several times in the course of the demonstration, a teacher was unable or unwilling to comprehend and employ the principles of contingency management set forth in the manual. Since these principles, applied in conjunction with programed administration, are the heart of this individualized instruction system, any attempt to implement the system without sufficient knowledge can only result in an ineffectual presentation.

Occasional deprecatory comments have been made by teachers to the general effect that the system is neither new nor unique. To an extent, such reactions are valid. But it must be realized that contingency management is a method for using well-known psychological techniques in a systematic rather than an intuitive fashion. The crux is not whether the teacher is or is not familiar with the principles, but whether the principles are being employed systematically and consistently. The typical teacher is seldom consistent in handling children or in applying college-acquired principles of behavior. Such inconsistencies resulting primarily from lack of structure in the usual classroom situation, can be overcome by the use of contingency management and individualized instruction. Contingency management provides a general structure in which systematic application of psychological principles can be attempted.

Systematic application does not imply mechanical repetition or unvarying precision. In addition to the structure, the manual presents general psychological principles. The teacher is free to use and combine these principles in many unique ways. The important

principles in many unique ways. The important

consideration is the systematic use of the guiding principles set forth in the manual. Unless the teacher has a positive, willing, attitude toward the adoption and use of the system, it will not be effective. The teacher must be convinced that the system of individualized instruction proposed here is practical and effective. Only then can the system be thoroughly learned and properly employed. Several possible factors producing negative or nonchalant teacher attitudes are listed below.

1. The amount of initial effort to prepare and introduce the contract.

2. Natural resistance to change.
3. Lack of confidence in individual ability to adequately implement the system.
4. Insecurity in a new role and reluctance to abandon the older one.
5. Lack of knowledge of the system and its application.
6. Ambiguities within the system itself and lack of complete specificity.

Initial Effort

Obviously, starting any new system requires more effort than retaining an existing one. In initiating the Contingency Management System, the teacher must give tests, generate diagnostic profiles, make up contracts, pass out programs, etc. Many of these initial tasks require a great deal of effort. But once the teacher thoroughly learns the system, many previous tasks become nonessential; for example, it is no longer necessary to lecture. After the introductory phase, the amount of effort required to teach the class will be less, or no more than that required with conventional group classroom procedures.

Resistance to Change

Well-established habits are generally convenient, comfortable, and highly resistant to change. When response patterns are organized to a point where they require a minimum of effort, the need for change is not easily understood. Some teachers fail to see the need for change even if the new method yields better student learning. Such teachers may not realize that their nonchalant attitudes are easily sensed by the student;

if they know, they may not care. This teacher attitude is not typical, but any teacher who works with low-achieving students may be tempted to adopt it in order to relieve personal frustration. Teachers in remedial classrooms have been virtually powerless to increase the gains generally recorded by low-achieving students. Remedial schools have been forced to develop techniques of social promotion because conventional methods of recognizing student achievement are totally ineffective. If teachers could see immediate results, as provided by the Contingency Management System, resistance to change might be overcome.

Lack of Confidence

In addition to formal courses in educational practices, teachers learn much from experience. Consequently, they tend to feel secure with their present techniques. Confronted with a new system, one which uses different terminology and changes the familiar group-oriented classroom into something quite different, teachers see the conventional classroom as a friendly, predictable place. In a group-oriented classroom, the teacher knows what all students are doing at any particular moment. The teacher in the individualized classroom can be certain only that students are active and are probably working on the proper materials. This may produce a feeling of uneasiness and disorganization for a teacher accustomed to the group-oriented system.

The Changing Teacher Role

Many teachers truly enjoy and are protective of their role as disseminators of subject matter information. Professional educators, however, consistently state that teachers should not be subject-matter-oriented. Teachers are urged to emphasize the methods of getting children to learn, rather than the mere presentation of information. In spite of these admonitions, many teachers still feel that subject presentation is their primary function.

This attitude must change. Today, programed instruction often disseminates information more effectively and efficiently than a teacher can. The teacher of the future, therefore, must assume a new role, that of motivator, embodying functions best performed by a human. The teacher's task will be to teach affective, not cognitive, behavior. To many teachers, this role will be even more satisfying than their present one. The problem today is to codify the role of motivator. Contingency management is only the first step.

Lack of Sufficient Instruction and Application

The manual represents a compilation of information concerning the Contingency Management System. It is designed primarily as a reference text, not a teaching text. As a result, teachers who merely read through the manual acquire the general concepts of the system, but do not completely understand its application or all the implications of the system. Accomplishing such depth of understanding would require the prospective teacher to take an extensive course in individualized instruction techniques. This manual might be used as a text for such a course.

The system is not yet complete. There are still many problems which have not been solved or even addressed. These problems occur constantly in the classroom, and the teacher who has slavishly followed the manual may at times feel helpless. If the manual offers no specific recommendation in a difficult individual case, the teacher is inclined to blame the system, with some degree of justification, for failure. More research on the implementation of the system in the classroom situation must be undertaken.

Final Recommendation

The results of the various projects in which the system has been employed are sufficiently heartening to recommend further applications.

The system appears to provide a positive atmosphere for low achievers that is necessary to produce motivation for the pursuit of academic goals.

In addition to its practical effects, the system, because of its specificity, increases the feasibility of studies of teacher effectiveness in areas dealing with interpersonal relations. The Contingency Management System also provides a testable model for motivational control.

Further research on the system and its application is indicated. The applicational research should be of two kinds: 1) further refining of administrative techniques to reduce unfavorable teacher and student attitudes; 2) further research into components of the system itself. It would be very valuable to determine the optimum ratios between preferred events and tasks. Attention should be given to better ways of scheduling, methods of signaling when preferred events should occur, and methods of controlling the selection and duration of preferred events.

PART II

Instructor's Utilization Manual

A DEMONSTRATION OF THE USE OF SELF-INSTRUCTIONAL AND OTHER TEACHING TECHNIQUES FOR REMEDIAL INSTRUCTION OF LOW-ACHIEVING ADOLESCENTS IN READING AND MATHEMATICS

Instructor's Utilization Manual

Submitted to

Media Research and Dissemination Branch

U. S. Office of Education

Department of Health, Education, and Welfare

Washington, D.C. 20202

Contract No. OE-4-16-033

by

Lloyd E. Homme, Ph.D.
Project Director

TMI Institute
213 San Pedro, NE
Albuquerque, New Mexico

PREFACE

This manual is directed to those teachers planning individualized instructional programs using programed learning and/or other self-tutoring materials. The techniques suggested herein have been arrived at by research methods.

To ensure the teacher's thorough understanding of the principles of the learning and performance systems proposed in this manual, it has been necessary to discuss certain elements of the behavioristic models of learning. Such considerations must precede a truly effective understanding. We urge teachers not to vault lightly over them. They should, in fact, add immeasurably to the teacher's scope of comprehension.

The methods outlined herein are flexible enough to be incorporated into any existing school system or to be used in the basic curriculum planning of any new system.

Dr. Lloyd E. Homme
TMI Institute
Albuquerque, New Mexico

TABLE OF CONTENTS

	Page
PREFACE	i
INTRODUCTION	1
I PROGRAMED INSTRUCTION	3
II MOTIVATION: THE PERFORMANCE SYSTEM	7
A. The Importance of Student Motivation	7
B. The Behavioral Analysis of Motivation	8
1. The Key Concept: Reinforcement	8
2. Reinforcement and Human Motivation	9
C. Task Motivation	11
D. Contingency Management	13
1. Experimental Theoretical Background	13
2. The Role of the Contract	17
3. Preparation of the Contract	18
4. Introducing the Contract	22
III ADMINISTRATION	25
A. Testing-Diagnostic Profile	25
B. Distribution of Materials	26
1. The Classroom	26

2. Storage and Availability 27

C. Evaluation 29

1. Diagnostic Tests 30

2. Course Pre- and Post-Tests 31

3. Unit Pre- and Post-Tests 31

4. Test Frames 32

5. Progress Checks 32

a. Description 33

b. Administration of Progress Checks 33

c. Grading Progress Checks 34

d. Grading 35

e. The Duties of the Teacher in the Self-Administered Classroom 36

1. The New Teacher Role 36

2. Selection and Training of Teacher Aides 39

3. Controlling the Physical Movements of Students 40

IV MODIFICATIONS 42

A. Programed Material Modifications 42

1. Deletions 42

2. Additions 45

a) Progress Checks 45

b) Adding Unit or Course Pre-Post-Tests 46

c) Other Control Devices 47

3. Modifications for Other Reasons 48

a) Addition of Audio Components 49

b) Modifying Visual Presentation 49

c) Response Mode Variation 50

B. CONTRACT MODIFICATION 52

1. Recognizing Malfunctions 52

2. Methods 52

a) Lengthening the Contract 52

b) Shortening the Contract 53

V HOW TO GET STARTED 54

GLOSSARY OF TERMS 59

INTRODUCTION

The basic concepts of individualized instruction and programed learning are not new, but the techniques involved in applying these concepts to the actual operation of individualized classrooms are of very recent origin. In the early rush to produce good programs, the problems of administration and student motivation were ignored. Programs were thrust into teachers' hands with no specific instructions or recommendations. Although learning results were generally good, the administrative problems led many teachers to conclude that programs were not worth the extra effort.

Recent research and testing has led to tentative solutions of administrative and motivational problems. Incorporating these solutions, the following three requirements have been formulated for a successful system of individualized, programed teaching in classrooms.

1) Excellent learning material, including the best available programed courses or graded readers.
2) Control of motivation through proper scheduling; providing consequences for all learning activities.

3) Control of student performance by frequent progress checks.

The first requirement is self-explanatory. Since program technology is rapidly changing, the criteria of good programing set up in many currently published texts are not entirely satisfactory. The "face validity" criterion has been much used but this technique considers only what is taught and evaluates neither the program's efficiency nor its effectiveness. As an aid to program selection, this manual includes a section that deals with programing considerations.

Most administrative problems of individualized instruction focus on control of student performance. A proven method of control is periodic testing. This method provides feedback to the student, enabling him to evaluate his own progress. Periodic tests, keyed to materials just learned, are termed "progress checks."

Since effective motivation depends on the scheduling techniques employed, various options should be considered. Some suggested options are discussed in the motivation section of this manual.

I

PROGRAMED INSTRUCTION

Programing is a special method of presenting material for the purpose of learning. A subject to be programed is analyzed and divided into small steps suitable for almost any learner who possesses the necessary entering behavior. ? The programing process is based on empirically validated learning principles. Programs are designed and prepared to provide the student with many of the advantages of individual tutoring and, hopefully, to produce the most efficient, pleasant, and permanent learning.

Programed instruction, like individualized instruction, induces active student participation to a degree not attainable through group lecturing or normal study methods.

Since the advent of programed instruction, many attempts have been made to define it. Such attempts usually list so-called "basic principles" such as immediate confirmation, small steps, self-pacing, student testing, and active responding. These terms do identify certain programing techniques, but, for the most part, they are not truly definitive in the broadest sense. A program can best and most easily be described by contrasting it with traditional education techniques.

1. A program is not a textbook. The subject matter of a textbook is organized primarily to aid in references. The subject matter of a program is deliberately and scientifically sequenced to make learning as effective and easy as possible.
2. A program is not a workbook. The purpose of a workbook is to exercise already established skills; the purpose of a program is to aid in the acquisition of new skills. Using techniques derived from psychological research and testing, program material is carefully selected to attain the desired end effect.
3. A program is consistent, permanent, and partially self-contained. It does not permit those differences in concept and variations of presentation that arise when several teachers teach the same subject or when one teacher teaches the same subject at different times. A program teaches the same subject the same way every

time. A program provides a permanent and complete record of student responses, thus allowing the effects of a program to be tested and validated. To permit accurate validation, a program must stand alone, independent of any other instructional inputs. Validation also pinpoints the parts of a program that need to be revised or modified.

In a normal lecture situation, it is difficult to determine if students are absorbing what is being taught. Psychological data indicate that learning occurs only when students are doing. This doing may take the form of overt action, thinking, analyzing, drawing conclusions, and so forth. For efficient learning to take place, it is necessary that the student properly interacts with the material. In lecture situations we have no assurance this interaction will occur. Programed instruction, however, provides built-in response control. In a properly prepared program, the student cannot complete the exercise without interacting with the significant portions of the material.

We can now more accurately define a program. A program consists of scientifically analyzed and sequenced content presented in a permanent form which allows testing, validation, and revision; and which, through various techniques of response control, ensures the student's interaction with and attention to the significant portions of the material.

II

MOTIVATION: THE PERFORMANCE SYSTEM

A. The Importance of Student Motivation

The establishment of sound, lasting student motivation is at once the most important and the most difficult step in building and applying an effective system of programed instruction. The initial student interest intrinsic in most programs often wanes after 300 or 400 frames. Full attainment of the learning objectives designed into any given program is very difficult unless proper motivation is provided.

Motivation is of utmost importance in all areas of education. No matter how well-conceived, organized, and behaviorally sound a presentation may be, students will learn nothing from it unless they attend and respond. Yet there exists no effective method of reliably producing student motivation. The importance of developing such a system cannot be overemphasized.

The motivational system detailed in this section represents a new approach to the problem. Reliable and readily adaptable, its use is suggested in any individualized instructional situation.

B. The Behavioral Analysis of Motivation

1. The Key Concept: Reinforcement

The actions or words of one person usually have some effect on one or more other persons. What one does or says may cause another to smile, to frown, to say, "Thank you," or to scold and threaten. These effects are often called the consequences of behavior. Some consequences of behavior cause a repetition of the behavior that produced them. Consequences having such an effect are called reinforcers. It is sometimes said that the word "reinforcer" is a technical name for reward. This may be misleading, since some events that look like punishments may, in fact, be reinforcing.

If it is desired that some behavior occur less frequently, it must not be followed by a reinforcer. This condition, although it sounds simple, is very difficult to achieve. The safest, and perhaps the only, way that one can be certain he is not reinforcing a response, is to ignore it.

For example, suppose a ten-year-old boy and his father are visiting a friend. The child, left out of the conversation, says, "Let's go, Dad." Dad has at least three choices here: He can punish the response by saying something like, "Quit bothering us. Can't you see we're busy!" Another option: "Okay, son, we'll go in a little while." Still another: Dad can arrange matters so that the request, "Let's go, Dad," has no consequences whatsoever. Almost everyone, at one time or another, has been annoyed by a child's repeated request of this sort. To consistently ignore this sort of behavior is terribly difficult. The temptation to occasionally pay attention in some way is almost overpowering. Yet, experimental evidence shows that to pay attention, i.e. to reinforce, only occasionally will establish the response in a repertoire even more firmly than will constant reinforcement. For example, if a whining child is reinforced only occasionally, it will be much harder to eliminate the whining than if reinforcement occurs every time. Once it is decided to ignore a bit of behavior, never let an exception occur.

2. Reinforcement and Human Motivation

Those who object to the simple statement of behavior and reinforcement presented here may argue that human behavior is a highly complex affair, involving much more than the simple matter of the consequences that behaviors produce. This may be a valid premise, but it surely is not a sound reason for ignoring the simple facts of life. Acceptance of the fact that human behavior is affected by individual emotions, ideas, hates, and loves, should not, as far as we can see, rule out also accepting the importance of the consequences of behavior.

People certainly are not like dogs, but people and dogs do have one thing in common: They learn. The most common method of training a dog is well-known. First making sure the animal is hungry enough to eat small bits of food, the trainer shows the dog how to perform a trick. When the dog completes the trick satisfactorily, the trainer gives the dog one of the bits of food. The opportunity to eat is a consequence of performing the trick. Since it increases the dog's inclination to repeat the trick, eating the food can be called a reinforcer. In the case of training a dog, one need not dwell on whether the dog "feels like working," or "is in the mood for learning," or whether he is "ready to learn," or anything of the sort. The dog will continue to work as long as he will react to food by eating and as long as the trainer's supply holds out. By extension, if there were something a human would react to as consistently as the dog does to a morsel of food, then the human would be equally easy to motivate. It is not socially acceptable to starve humans, so food cannot be used as a reinforcer, and other possibilities must be explored.

C. Task Motivation

Motivation is often loosely termed the "energizer" of behavior. In employing such a definition, it is said that individuals are motivated to eat, to sleep, to make money, to be famous, etc. However, such a broad definition does not aid in determining which methods will maintain activity in classroom learning tasks. Therefore it is necessary to limit this definition to a more specifiable condition. In this manual, the phrase "task motivation" will be used. When an individual initiates and completes a given task, he has task motivation. If the task is the construction of a retaining wall and the individual completes it, he has task motivation. If the task is completion of a page of graded reading material and the individual completes it satisfactorily, he has task motivation. Task motivation, then, is a descriptive, summarizing term for the complex of behaviors a student displays when he is attending to and responding appropriately to his given task assignment.

Task motivation is particularly important when programed course materials are used, since early courses ignored the problem of motivation. Generally speaking, programed instructional materials are published with no specific directions or recommendations to control motivation of the student using them. The learning results of these materials are generally good, but students often fail to complete them. This lack of task motivation may be observed in normal students with average motivation. The problem becomes critical when programed materials are used for potential high school dropouts, who historically lack self-motivation. If a student with average motivation has trouble completing a course, more difficulty can be expected in getting a non-motivated high school dropout to finish.

Although motivation is widely held to be a complex phenomenon, practical considerations of motivation can be reduced to one simple question: What reinforcers are available? Or, said another way, What events are available to motivate behavior? For everyday applications, it is not necessary to fully understand the operations of the complex phenomenon of motivation. It is only necessary to have a good idea of what events serve as motivators, so these events can be used to control the interest of the adolescents.

For behavior to be strengthened so that it will recur, it must be followed by some preferred consequence as reinforcement. Laboratory studies of reinforcement typically use the preferred consequence of eating or drinking to motivate animal behavior. Equivalent kinds of reinforcement can be used with children. However, this kind of payoff for learning activities in the classroom is awkward. Students cannot be starved, nor can candy be placed in their mouths for correct responses. This creates the impossible position that rewarding consequences are necessary but impractical.

D. Contingency Management

1. Experimental Theoretical Background

David Premack found evidence that, when an event functions as a reinforcer, it does so because the experimenter has arranged matters so that the event has a higher probability than the behavior to be strengthened. Drinking, after water deprivation, has a higher probability of occurrence than any other response in the apparatus. In a critical experiment, further support for the differential probability hypothesis was gained when Premack was able to show that, under appropriate conditions, the usual relationship could be reversed and drinking could be reinforced by the opportunity to run, rather than the other way around. In Premack's experiments, it is the reinforcing response which is emphasized, not the *reinforcing stimulus*. This indicates that activities as well as conventional rewards may motivate.

The Contingency Management System

The concept of a reinforcing response has led to the discovery of many "new" reinforcers. It is difficult to classify all these as being high probability behaviors because they may not be emitted more than once in any session. The phrase "preferred events" is useful to designate these behaviors. In one recent experiment, activities were used as preferred events to reinforce learning tasks for pre-school children. When the preferred event of running down the hall was made contingent upon the completion of a counting exercise, the counting behavior was strengthened.

The influences of socio-economic conditions, of life goals, of cultural factors, family emphasis, and the peer-group are considerations important in the general motivation of all people. But task motivation is most often a function of immediate and concrete factors. For example, a typist would not be likely to remain on the job unless she expected a pay check at the end of the week, but the close-range goal of finishing a letter has more effect on her immediate behavior than the pay check. Long-term goals are important, but behavior is most affected by immediate consequences.

Motivation most often involves a specific immediate goal: talking, smoking, playing games, etc., referred to as "preferred events." In order to obtain the preferred event consequence, a specified task must be adequately performed. We might diagram this as:

Specified task——> preferred event.

In such an arrangement, if the task is not completed, the preferred event, or goal, will not occur. We say that the preferred event depends upon or is contingent upon the performance of the task behavior.

Everyone is familiar with such contingencies, having been exposed to them since childhood. "Eat your peas; then you may have your dessert." is a familiar example. The preferred event here is eating dessert, and is contingent upon the adequate performance of the task of eating peas. There is nothing new or startling about these principles of motivation, nor is there anything complicated about them. All that is needed to make them work is continual and systematic application. To accomplish this, it is only necessary to remember two principles:

1) There must be a clearly observable, immediate preferred event.
2) There must be a true contingency. That is, unless the task is completed, there can be no way to achieve the preferred event.

These two principles form the basis of a motivational system called "contingency management."

Applying contingency management in the classroom requires selecting preferred events and arranging them so that they occur only _after_ the assigned task has been completed.

2. The Role of the Contract

The contract is a fundamental concept of our socio-economic system. If a prospective client comes to an architect and asks him to design a building, the two parties, after discussion, may enter into a mutual agreement or contract. When mutual satisfaction is attained, i.e. the plans suit the client and the fee suits the architect, both parties have lived up to the terms of their contract.

Traditionally, the conventional classroom only vaguely approximates an arrangement where student behavior leads to preferred events. Most students are trying to avoid aversive consequences rather than working to earn positive consequences. This is clearly revealed at test-taking time. The possibility of achieving a high grade generally does not make the students eager to be tested. Rather, successful students are anxious (sometimes pitifully so) because they may get a low grade and potential dropouts don't even try; they know from experience that they will get a low grade.

The contingency management contract not only creates motivation, but strengthens the experience of fulfilling the terms of the contract. In industry the employee has a job to perform, and the employer has the responsibility of paying for that job. Students soon learn that, in order to satisfy their wants, they must perform an action for which some person is willing to pay them.

3. Preparation of the Contract

Use the student's diagnostic profile (See III, Section A.) as an aid in preparing his contract. This profile lists the tasks to be performed by each student. You should also make a list of general preferred events. If you have worked with a student before, you may already have an idea of his preferences. If so, use them to help you prepare his contract.

You will have to make up a contract for each student every day, but this will become easier as you familiarize yourself with the system.

Tasks are usually put on a ratio schedule; that is, a prescribed amount of activity. Preferred events are on an interval schedule; that is, they are timed.

The actual preparation of the contract can be done by you or your teacher aide (See III, Section E.) in one of two ways:
1) A serial listing of tasks and consequence activities. Study the example below. (Note: The student's preferred events are underlined.)

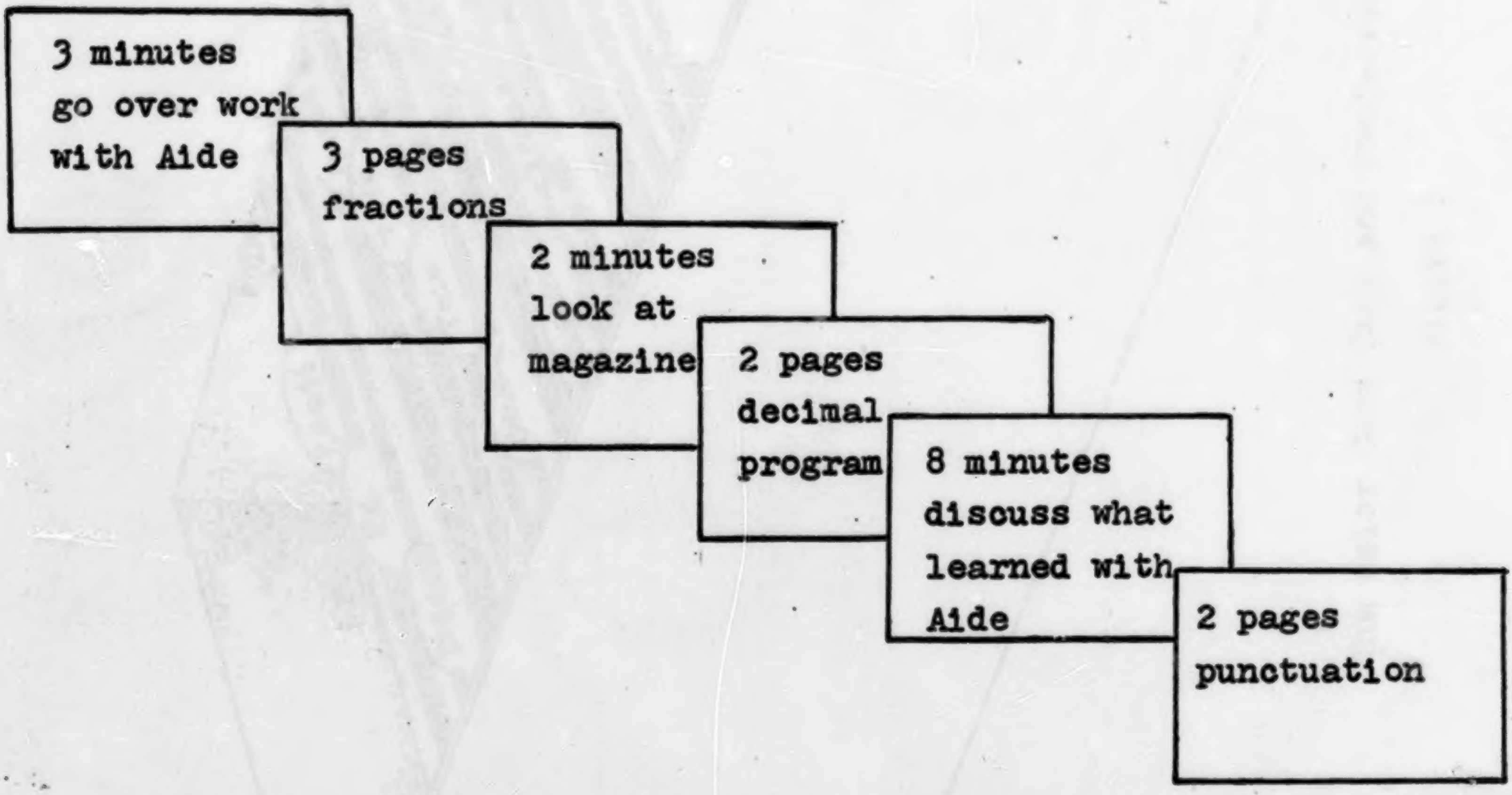
(Date:)____________ Contract for:________________

2 pages	punctuation
8 minutes	discuss what learned with Aide
2 pages	decimal program
2 minutes	look at magazine
3 pages	fractions
3 minutes	go over work with Aide
4 pages	punctuation and take progress check
5 minutes	help teacher clean boards and erasers

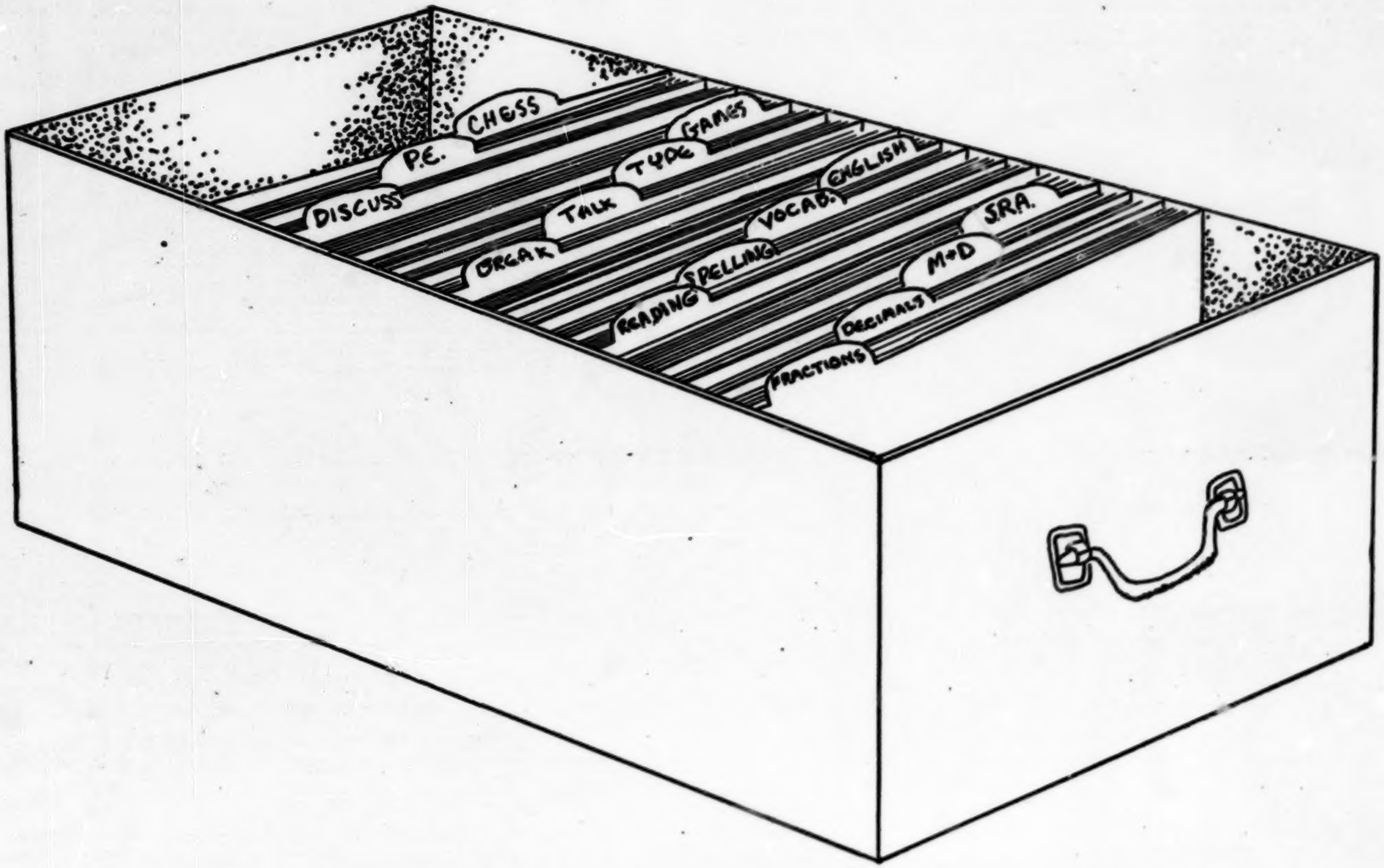
It is best to require only small tasks on the first contracts. As the student's task-completion rate increases, gradually add to the magnitude of the task.

2) The second method of contract preparation is probably more efficient. We suggest that you begin using this system after you have become familiar with the first method.

Accumulate a list of preferred events on 3 x 5 cards, one activity per card. Do the same for each task.


3 minutes
go over work
with Aide
3 pages
fractions
2 minutes
look at
magazine
2 pages
decimal
program
8 minutes
discuss what
learned with
Aide
2 pages
punctuation

In time you will acquire a file of these cards, adding to them every time you discover a new preferred event. The use of cards eliminates writing each contract; you need only draw the cards from your file. An illustration of a typical file appears on the following page.


CHESS
GAMES
P.E.
TYPE
ENGLISH
DISCUSS
TALK
VOCAB.
SRA.
ORGAN
SPELLING
M+D
READING
DECIMALS
FRACTIONS

The Color Card Task and Preferred Events File

Figure 1

The following is a list of steps in Contract Preparation.

1) Selection

   a) Use the diagnostic profile, if available, as a guide to the student's capabilities.

   b) Use the list of suggested preferred events as a prompt. (Remember, this is only a suggested list; try any other preferred event you know of or devise.)

2) Preparation

   a) Schedule tasks by amount of work to be completed.

   b) Schedule preferred events on an interval schedule (timed).

   c) Prepare the contract using either cards or a list.

   d) Gradually increase the magnitude of the task.

4. Introducing the Contract

When introducing the contract into the classroom, your first step is to acquaint the student with the administrative control of written instructions.

As an approximation, write instructions on the blackboard.

This may be a normal assignment. For example, "Take your program and turn to page 23." This might be followed by, "Now turn to page 30," or "Go through the first four frames on page 1 of the program." Explain the students that in the future they will receive similar instructions on cards. These cards will show an entire schedule of activities and the student may go from one activity to the next without additional instruction.

The final steps involve giving a single card to each student. A typical card might carry the instruction, "Work on your assigned program for 20 frames." Adding instructional cards soon brings the entire contract into the classroom situation.

The teacher or an aide must control the contract. On receipt of his daily contract, the student may be allowed to indicate preferences for contingency activities, and these preferences should be considered when preparing the following day's contract. The existing contract should never be modified on the same day in which it is being performed.

Two contract factors must be controlled:

1) It must be determined if the student has fulfilled the terms of the contract, considering both the amount of work and

its adequacy. This is often accomplished through teacher-graded progress checks.

2) The amount of time a student expends on his preferred events must be controlled. Probably the best approach is to use an honor system. Each student is required to note the time at the beginning and end of his preferred event and he is cautioned to attempt to limit the time to that specified on his contract. Minor infringements of time may be overlooked, but action should be taken in cases of excessive and consistent infringement.

The routine of daily roll-taking may be utilized to distribute the contracts. Contracts can be either centrally located or distributed. If each student is to receive his own contract, they may be placed before class on each student's desk. After preliminary activities, the student should go directly to his work area, obtain his materials, and begin working.

If there are no assigned work areas for each student, contracts may be placed on a centrally-located table where each student can conveniently check his contract.

III

ADMINISTRATION

A. Testing-Diagnostic Profile

In any instruction situation, it is very helpful to have adequate information on student ability. This is particularly true of individual instruction. Therefore it is recommended that pre-tests be given to all students. Either an accepted, standardized achievement test or a pre-test provided with the course may be employed. The pre-test will provide a measure to use in determining the improvement of each student. The test may also serve as a diagnostic tool to help pinpoint each student's specific problems.

If a standardized achievement battery has been used, a diagnostic chart may be constructed. Such a chart will provide a permanent individual record of a student's strengths, deficiencies, and knowledge gaps.

Test Date: ________	**Name:** ____________
Punctuation:	**comma fault**
Decimals:	**decimal fractions**
Fractions:	**common denominators;** **mixed numbers**
SRA:	**level green**
Spelling:	**plurals**
Strengths:	**music, algebra, and biology**

Sample Diagnostic Chart

Ideally, the Diagnostic Profile system will prevent the student being assigned subject matter in which he needs no help.

It may be an excellent idea to discuss the diagnostic profile with the student, showing him his weaknesses and strengths. A copy of the chart may even be given to the student for his own reference.

B. Distribution of Materials

1. The Classroom

Any conventional classroom may be used to administer programed

instruction. It may, however, be desirable to rearrange furniture and designate specific areas for use in individual instruction, group instruction, or other activities. There is no need to physically modify the classroom the first day programed instruction is used. However, a definite room plan should be formulated.

On the following page is a diagram of a suggested room plan.

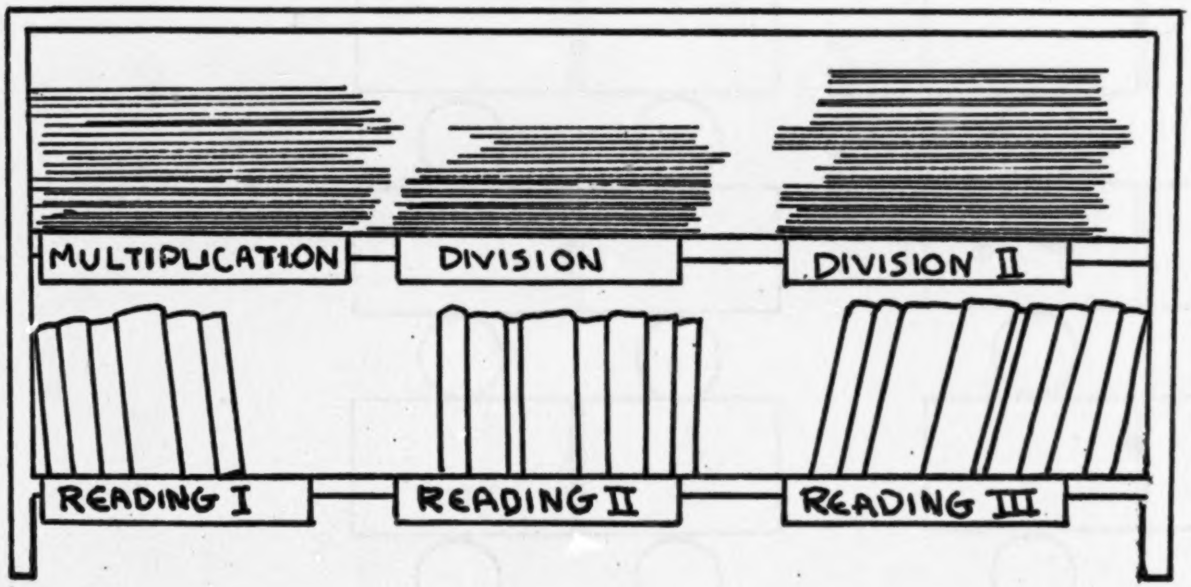
2. Storage and Availability

The ideal classroom for individualized instruction should allow rapid movement throughout. Desks, storage racks, games and places for physical activity should be so located and designated as to allow each student to perform his prescribed activities in well-defined areas.

The task area should be centrally located, containing the requisite number of desks, each occupied by one, or at the most, two students. In close proximity, should be storage cabinets containing clearly-labeled compartments for all necessary materials.

The preferred events areas may be located in the back of the room, or in any area sufficiently isolated to minimize disturbance of those students working in the task area.

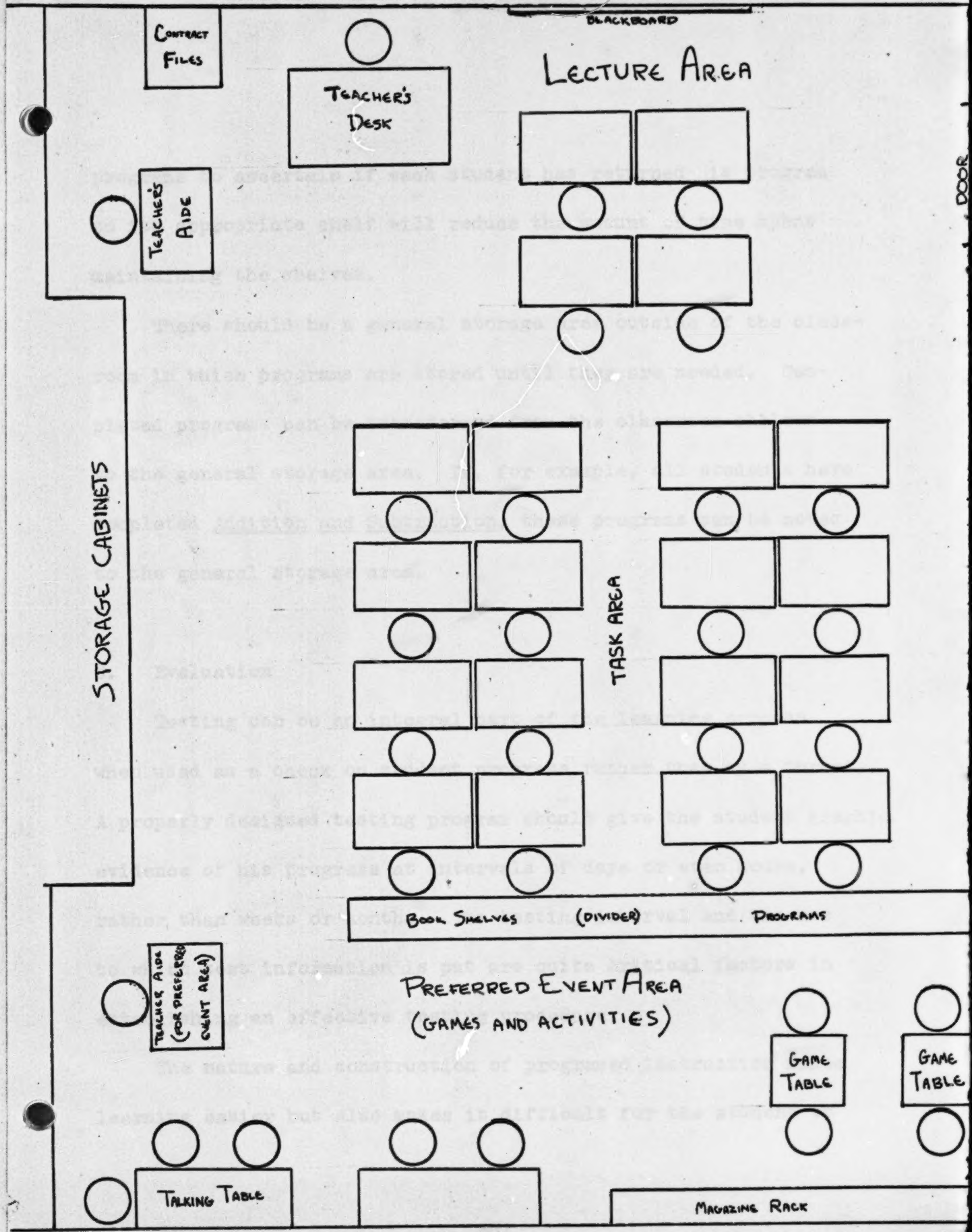
Essential materials must be kept readily accessible to each student. Reading materials in book form are kept on bookshelves, marked so the student can quickly find needed material. As the student finishes one program he will move to the next, and materials should be stored in some corresponding order. Note that in the figure below, Reading I is followed by Reading II.



Suggested method for program storage.

Although students should have free access to the shelves, the instructor or teacher aide should exercise a certain measure of control over the material. Keeping a current inventory of

SUGGESTED CLASSROOM FOR INDIVIDUALIZED INSTRUCTION


BLACKBOARD
CONTRACT FILES
TEACHER'S DESK
LECTURE AREA
TEACHER'S AIDE
DOOR
STORAGE CABINETS
TASK AREA
BOOK SHELVES (DIVIDER) PROGRAMS
TEACHER AIDE (FOR PREFERRED EVENT AREA)
PREFERRED EVENT AREA
(GAMES AND ACTIVITIES)
GAME TABLE
GAME TABLE
TALKING TABLE
MAGAZINE RACK

programs to ascertain if each student has returned his program to its appropriate shelf will reduce the amount of time spent maintaining the shelves.

There should be a general storage area outside of the classroom in which programs are stored until they are needed. Completed programs can be transferred from the classroom shelves to the general storage area. If, for example, all students have completed Addition and Subtraction, these programs can be moved to the general storage area.

C. Evaluation

Testing can be an integral part of the learning process when used as a check on student progress rather than as a threat. A properly designed testing program should give the student graphic evidence of his progress at intervals of days or even hours, rather than weeks or months. The testing interval and the use to which test information is put are quite critical factors in establishing an effective testing procedure.

The nature and construction of programed instruction makes learning easier but also makes it difficult for the student to discriminate that he is learning. As a result, many students become discouraged; in many cases programs are left on shelves, never to be used again. However, since learning is accomplished, testing may serve as a reinforcing measure and often proves to be a preferred event rather than a task.

1. Diagnostic Tests

Students should be given diagnostic tests before they begin a program. The student should understand that such tests are primarily intended to diagnose his strong and weak points, and that grades are of secondary importance. He should be informed of his test results.

The diagnostic test should be a standardized achievement battery. This test may determine the specific area of remedial concentration necessary for a given student. For example, the diagnostic test may indicate the student's weakness in a single mathematics operation, despite overall strength in arithmetic. Therefore, the task for that subject becomes a short range project requiring a few hours of concentrated study.

2. Course Pre- and Post-Tests

Some programed materials available today include Course Pre- and Post-tests. Before a student begins a course, he takes the Course Pre-test. Although there is no grade given on the Pre-test, the score is recorded for later comparison with the Post-test score. The Course Pre-test is an index which, when compared with the student's score on the Course Post-tests, affords graphic evidence of his progress. The Post-test is identical to, or parallel to the Pre-test, only it is given after the student has completed the course. The Post-test score minus the Pre-test score equals the gain score, and this gain score shows the amount of new material the student has learned from the course.

3. Unit Pre- and Post-Tests

Some programed materials also provide Unit Pre- and Post-tests. A program is usually divided into "units," much like chapters in a conventional textbook. The student should be given the Pre-test before beginning each unit, and the Post-test after completing each unit. If the student does not score high on the Post-test, do not allow him to advance to the next unit; require that he repeat the unit or give him personal tutoring.

Unit Pre- and Post-test Answer Sheets are usually provided in each program. These are collected and controlled by the teacher.

4. Test Frames

Test frames are often part of the printed program. These frames do not provide a confirmation; instead, the word "Test" or "Practice" is printed in the confirmation area. They serve to control cheating, since answers to test frames can not be checked until the unit is completed.

Individual charts which give each student a unit-by-unit record of his percentage of correct answers to test frames may be constructed. This chart may be placed in the student's reference book (See Part IV).

In Part IV you will find instructions for preparing student control materials for programs containing no test frames.

5. Progress Checks

a. Description

Progress checks are vital in evaluating learning, because they let the student see that he is learning and progressing. Progress checks are short tests usually not included with commercially available programs. They should occur every 40 to 50 frames in a typical program. The student usually scores progress checks himself. To prevent the student's proceeding to material for which he is not sufficiently prepared, the unit tests or every fourth or fifth progress check should be graded by the teacher.

Progress checks are occasionally included with programed materials, but in most cases the teacher will have to construct his own (See Part IV).

Progress checks are probably the most valuable self-evaluation device available to the student. They should, therefore, never be omitted.

b. Administration of Progress Checks

Frame markers, or a reference list, are used to signal the student that he must now take a progress check. The teacher or an aide may hand out the progress checks, or they can be placed on a "self-service" shelf. In the latter case, the progress checks should always be on the same shelf as the programs to which they apply.

When the student has obtained the correct progress check, he answers the questions on a separate piece of paper. Since it is reusable, he should be cautioned not to write on the progress check sheet.

c. Grading Progress Checks

Progress checks may be graded by the student, the instructor, or an aide. It is important that the progress checks be graded as soon as possible so the immediate consequences of learning may be evident.

The student may check his own progress check. Since the instructor should grade unit tests and occasional progress checks, any temptation to cheat during self-checking is forestalled by the student's knowledge that his progress will eventually be accurately measured.

Satisfactory performance on a progress check may be used to signal the completion of the contingency contract. The student may then engage in his preferred event. Under appropriate circumstances, self-checking itself may be used as a preferred event.

d. Grading

Progress reports provide ongoing evaluations of the student's present achievement level. There are a variety of ways to designate achievement levels. These include:

1) Letters from the alphabet:

A = excellent; B = good; C = average; D = below average; F = failing; or,

E = excellent; S = satisfactory; U = unsatisfactory.

2) Numerical percentages:

90% - 100% = excellent; 80% - 90% = good;

70% - 80% = average; and 70% and below = failing.

Despite their limitations, conventional grades do furnish valuable information to the student. If the aversive consequences are eliminated, most students like to know how well they are doing. More important, the teacher's constructive evaluation is invaluable in assisting the student to assess his own performance and take corrective action if necessary. All students can benefit by learning their strengths and weaknesses, especially if such information is coupled with positive suggestions for action.

Each student should be issued a written progress report every two weeks. In each area, students receive a grade of excellent, good, or fair, based on the objective criterion determined from the average of their progress checks.

Excellent = 90% - 100%
Good = 80% - 89%
Fair = 79% and under.

Under this system no student receives a failing grade.

e. The duties of the Teacher in the Self-Administered Classroom

1. The New Teacher Role

The introduction of programed learning into the classroom changes the role of the teacher, but not his goals. He is still a teacher. The advance of technology has produced similar changes in many other professions and occupations. For example, the function of the mathematician in today's complex society is much the same as it was before the invention of the abacus, the adding machine, the calculator, or the computer. These machines have not changed the mathematician's goals, but they have changed his role and have increased his quality, standards, and efficiency. Despite the machine-induced role changes, mathematicians are not an extinct breed, and never will be.

As a further example, the goals of the housewife of 60 years ago were no different than those of today's. Her primary function was to express her love for her husband and children by making the home as warm and comfortable as possible. Today, because she may subscribe to a diaper service does not indicate that she loves her child any less. The fact that she has running water in the kitchen does not mean she loves her husband any less. Such modern conveniences have not changed her goals. They have only made her goals easier to attain.

In a similar way, automation in the classroom will enable a teacher to attain his, or her, goals much easier, more quickly, and more efficiently. This will necessitate a change in the teacher's role, not his goals. In fact, the role change toward increased efficiency will better supplement these goals.

The role of the teacher will change in that his tools and techniques will change. He will be able to manage a classroom with efficiency unheard of today. He will become an experimenter and inventor, a highly professional educator helping to create a specifiable technology. He will invent a teaching technology so efficient that the words "slow learner" may remain in our language only as an historical oddity.

The use of programed or other forms of individualized instruction in the classroom enables the teacher to spend more time giving individual aid and less time in necessary but incidental tasks. The teacher will be able to spend more time with the Diagnostic Profiles, advance work assignments, and with individual tutoring. If, for example, a student is unable to make the discriminations required in a given section, the teacher can, 1) work with the student on that part of the program, or, 2) assign a student who has tested very high in this particular subject to work with the student in difficulty.

By eliminating most of the trivial tasks, the teacher can keep in touch with each of the students and know how each is progressing. When students need extra help, the teacher will have time to give the needed individualized attention.

2. The Selection and Training of Teacher Aides

What factors indicate a potentially good teacher aide? In order to obtain the best assistants, one can look for:

a) Natural leadership. Students tend to follow instructions from a natural student leader, often as readily as they follow instructions from a teacher. As the system becomes well established, the need for natural leadership, however, diminishes.

b) High level performers. There are always those who can keep ahead of the rest of the class, or can at least stay even with the average, just by working part time. This is a necessary qualification, since an aide's duties often prevent him from using the full period for instruction.

c) Motivational considerations. The opportunity to play the teacher role is a motivating activity for many students. The formal teacher aide system provides such an opportunity. It can usually be determined conversationally if such a role is a preferred event for a given student. If the student indicates he might like to try it, the duties may be one of the preferred events in his contract. If the student continues to show interest, this preferred event can become a permanent part of his contract. Since acting as a teacher aide is contingent on completing his assigned tasks, many students will work much harder than usual.

d) Considerations of duties. Aides may be taught to perform either a specialized task or all the necessary tasks. Duties vary, from the more complex tasks of distributing, correcting, and recording progress check scores to those as menial as passing out programs, paper, and pencils.

The most important consideration in instructing a teacher aide is to gradually increase his responsibility for administrative tasks. Only a few aides should be trained at any one time. The aide should first be taught to distribute progress checks, then to distribute material.

3. Controlling the Physical Movements of Students

Physical movements of the students should be under control of the contract and should be loosely supervised. A student, for example, may take a break only if his contingency contract permits it. The teacher must see that each student follows his contract.

IV

MODIFICATIONS

Undoubtedly, problems will arise that do not exist in the conventional classroom. Complete precision and infallibility are not inherent in any new system or technology. It is not possible to foresee every potential problem.

The teacher must learn to troubleshoot in the new classroom. The best procedure to locate a malfunction involves moving from a general diagnosis to the isolation of the defective component.

A. Programed Material Modifications

Most programed materials now available are not constructed to meet classroom requirements. It is not practical for each teacher to devise programs suitable for his own particular requirements, but it is feasible to modify existing programs.

1. Deletions

Deletions in the program should be made only for the following reasons:

a) Unnecessary Information

Some programs will contain information not necessary to a specific project. These portions of the program may be deleted. However, caution should be used, since such deletion may cause some confusion.

b) Prior Knowledge

Occasionally, a student or the entire class may be already familiar with some information given in a program. If the students can use the review, they may be speeded through, skipping certain segments of the unit.

Indications of the student's prior knowledge are derived from two sources: the diagnostic test and the student interview. If the pre-test shows a student to be strong in a given area, he may be allowed to skip the unit or program covering that area. If the student says he knows the material, this should be verified by administration of appropriate progress checks. Any student who attains a 90% correct level may skip the material.

c) Student Ability

A certain course often appears too easy for a student.

Excessively high rates of speed or near-perfect progress checks often indicate such a student. This student should be allowed to proceed as rapidly as he can by letting him omit certain segments of the unit. Some programs employ accelerated or review pathways; such pathways require that the student complete only the introductory and criterion frames of each unit. A unit of 200 frames may have an accelerated path which includes, say, frames 141-200; the student then skips frames 1 to 140 and goes directly to frame 141. Another unit may require the student go through several parts, such as 1-6, 41-44, 108-125 and 140-160. In all cases, progress checks verify his grasp of the entire unit. If performance on the progress checks is not adequate, the student should go through the entire unit.

Most published programs do not specify accelerated pathways. As a simple alternative, the accelerated student may be allowed to respond to only even-numbered frames. This usually permits the student to gain all the information in the unit while avoiding much redundant practice. Of course, adequate performance on the progress checks remains a necessity.

When diagnostic Pre-tests show that a student has partial knowledge of a subject but needs his skills strengthened, the student should review the material, using the accelerated path. This review allows the student to bring his knowledge and skills, as indicated by performance on progress checks, up to criterion level in as short a time as possible.

2. Additions

a) Progress Checks

The teacher can efficiently make only a limited number of changes in a program. Probably the most worthwhile modification is the addition of progress checks (Part III, Section C). Progress checks are the most important components of the self-evaluation system. In addition, as short tests designed to find out if the student is absorbing and retaining the material, they provide the teacher with an ongoing analysis of student performance.

Progress checks should follow immediately after a significant amount of information has been learned, usually after every 40 or 50 frames. There should be approximately three to five questions on each progress check, depending on the complexity of the material. If the topic contains quite a few discriminations, the number of frames between progress checks should be reduced, and/or the number of questions in the progress check increased. It is not recommended that the questions total more than seven. When the material is comparatively simple, three to five questions may suffice.

To be true indicators of performance, the progress checks must have content validity, i.e., all the major discriminations covered in the frames should be covered in the checks.

The rules for writing progress checks for programed material are as follows:

1) Progress checks should occur every 40 to 50 frames, depending on the complexity of the material.

2) If there are many discriminations, there should be at least five questions, with a maximum of seven.

3) The questions in the progress checks should test the major discriminations and operations covered by the frames.

b) Adding Unit or Course Pre- Post-Tests

As stated earlier, the primary purpose of the pre- and post-tests is to evaluate student achievement by comparing scores attained before and after studying a specific unit. When the program has no course pre- or post-test, or unit pre- or post-test, such tests should be prepared. This can be done in a manner similar to the way progress checks are prepared. By using the questions in the progress checks as a guide, one can easily construct a course post-test.

c) Other Control Devices

Many techniques have been used to control acquisition. Such techniques are generally not as effective as progress checks. In group situations, testing and spot checking are often employed. Spot checking, i.e., looking to see if each student is responding, is only minimally adequate in individualized instruction. Such procedures usually suppress overt cheating, but have little effect on inattention and may even inhibit productive work.

Another method is, of course, the test frames. As described previously, in a test frame the student receives no confirmation; thus it is impossible for him to merely copy the answer. A test frame Answer Sheet, to be retained by the teacher, is usually provided. The student may, at the end of the unit, check his test frames against the answer sheet to determine his score. Test frames can be added to or deleted from any program. Obscuring the answers turns an ordinary frame into a test frame, and, conversely, inserting an answer in the confirmation area converts a test frame into a regular frame.

The two major objections to test frames are that not all programs have them, and that adding them requires considerable effort. Progress checks require much less effort and they are more effective. Therefore, progress checks are recommended above test frames as a student control procedure.

3. Modifications for Other Reasons

In a programed text, the stimuli are usually visual. The student reads to himself and examines any figures or drawings to arrive at the correct answer. Of course the printed program is not the only possible mode of programed presentation. There are a number of commercially available teachine machines with audio-visual capabilities.

Almost all devices have some response evaluation device, ranging from a right-wrong buzzer to a computer which selects remedial pathways. In this manual, however, we have limited ourselves to what may be done by the average teacher with inexpensive equipment.

a) Addition of Audio Components

The easiest procedure for adding an audio component to the program is to have the students in turn read aloud the verbal portion of each frame. This method is of particular help to those students who have reading difficulties. Such a procedure is, naturally, group and not individually paced, but if the group is kept reasonably small and homogeneous this is usually not a severe limitation.

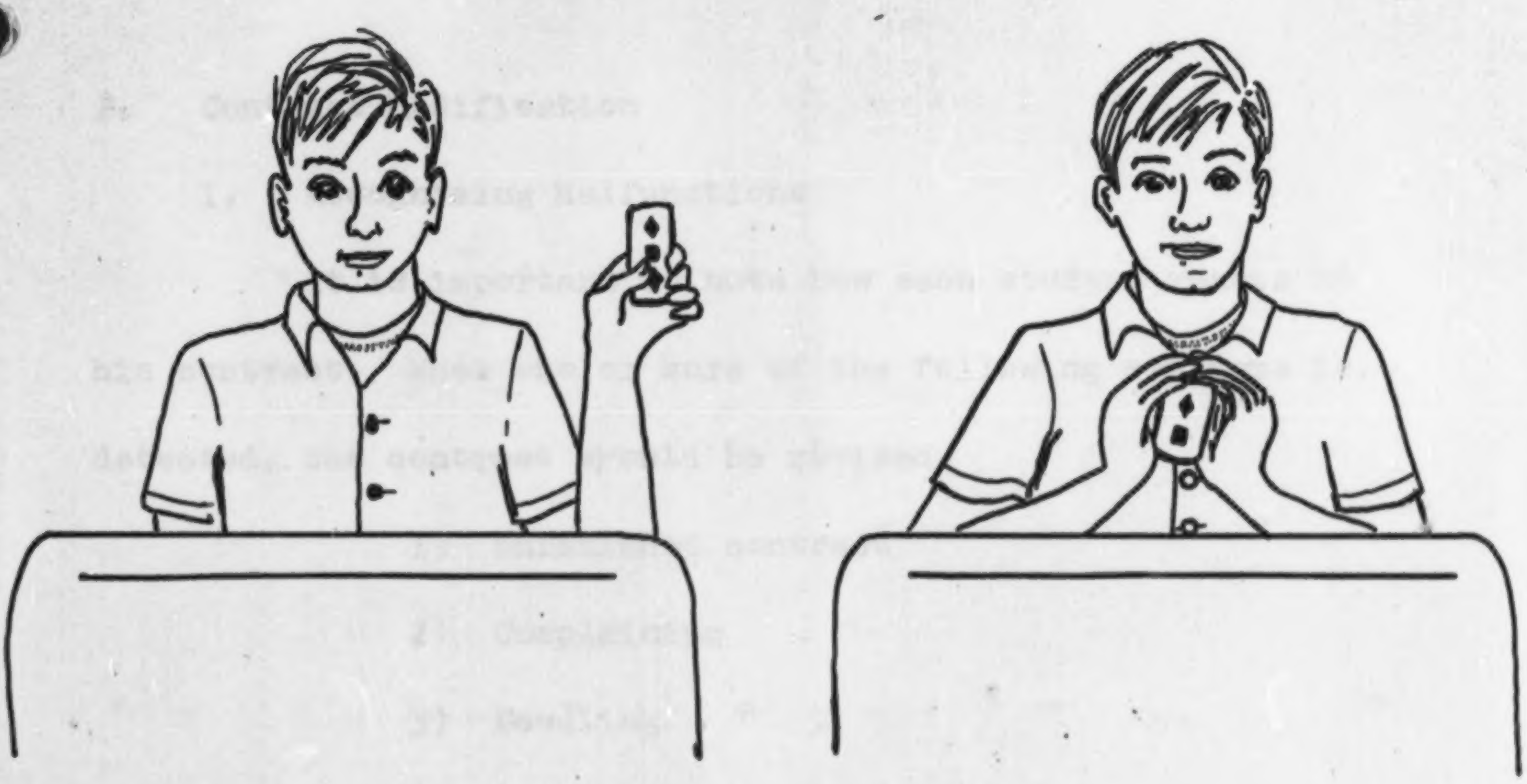
An alternate approach is to tape record the verbal material for each frame. The students may follow along with their programs and examine the associated figures. There are, of course, more elaborate audio systems which provide earphones for each student connected to his own tape deck.

b) Modifying Visual Presentation

If the demand for programs exceeds the available supply, programs may be placed in an opaque projector. The students may examine and respond as a group. This system is, of course, fixed paced.

c) Response Mode Variations

In all of these procedures it may be desirable to allow alternative methods of responding. For example, students may be permitted to write constructed responses on a pad or to type them. A successful group technique employs multiple-choice items with signal cards marked or colored to indicate different responses. The student holds the card in front of him, as shown in Figure 4. The teacher may then rapidly scan the room and immediately evaluate student performance.



Incorrect Way to Show Response Card **Correct Way to Show Response Card**

Figure 4

B. Contract Modification

1. Recognizing Malfunctions

It is important to note how each student reacts to his contract. When one or more of the following symptoms is detected, the contract should be revised.

1) Unfinished contract
2) Complaining
3) Dawdling
4) Talking and wasting time
5) Looking at the clock
6) Inattention to instructions or details.

A student fails in the classroom because the motivational system fails. Students exhibiting any of the above listed behaviors will probably require special attention.

2. Methods

There are two ways of revising the contract: lengthen the contract, or shorten it.

a) Lengthening the Contract

When the student finishes his contract before the expected time, the contract is probably too short. The student should receive the full benefit of the extra free time as a reinforcement for finishing his contract the first day. On the second day, however, the contract may be lengthened by adding more tasks and preferred events.

b) Shortening the Contract

When the student consistently fails to finish his contract in the allotted time, the contract should be shortened. Tasks should be systematically deleted from each of the subject areas the student is learning. For example, if the student is going through Decimals, Punctuation, and Spelling, the first step should be to remove one task card from each of these subjects. An entire subject is never completely removed. If this procedure does not work, the teacher is probably not using the preferred events most appealing to that particular student. One should then reexamine the situation and attempt to introduce those preferred events that will motivate the student to finish his contract in the allotted time.

V

HOW TO GET STARTED

This chapter suggests procedures for integrating the Contingency Management Motivation System into the classroom. It may be necessary to vary this procedure to allow the specific problems of individual classrooms. Use of the included check list may be helpful.

Selection and Evaluation

Decide which students will participate in the program. Pre-test the selected students, using a standardized achievement test. Score the tests, and using the test results, make a diagnostic profile card for each student. Order the programs necessary to correct the profile deficiencies.

Familiarize yourself with the programs. If progress checks are not available for the programs, prepare them.

Prepare a student folder for each student and write each student's name on the front of his book. Place each student's diagnostic profile card in his folder. List the programs the student should complete to correct his profile deficiencies. List the non-programed materials. Place the list of programs and non-programed materials in the folder.

Introducing Students to Programed Instruction

Choose one program that the largest number of students will be working on, and introduce this program to all the students. Progress checks for this program should be available. A progress chart for each student, showing his before- and after-course scores should also be placed in the student's folder.

Tell the students how to use programed instruction. Show them how to proceed from frame to frame. Show them how the pages are numbered. Show them how the books are divided into units. If the program includes masks, show them how to use the masks. Explain the procedure for taking progress checks, how to get progress checks scored, and how to enter the progress check scores on the progress sheet in the folder.

Tell the students not to write in the program textbooks because they will be used by other students. Explain to them that progress can occur only if satisfactory scores are made on their progress checks. Tell what scores will be required for the particular programs. Tell students how to find their places in their programs.

Starting the First Program

On the day that programed instruction is first used in the classroom, have the students begin the programs at the same time and work until they have reached their first progress check. The students will reach the progress check at different times so the instructor can observe each student to make sure he understands the progress check system. After the student has completed the progress check, the instructor should grade it. The student should then put the progress check in his folder.

Next, teach one student how to grade progress checks. (See section on How to Train Student Aides.)

On the second day, introduce the second program to the students who have learned how to use the first program. Introduce the first program to the students who have not yet begun programs. Repeat this procedure until all students are working on programs.

How to Introduce Contingency Contracts

When all students are working on programs, contingency contracts should be introduced. On the first day, each program should have only one task card so that the students will be able to complete their contracts on that day. The instructor should provide some large reinforcers (for example, going home early) for all students who do complete their programs.

On the second day, increase the student contracts to two or three cards per subject. Provide small reinforcers, such as breaks, for completing three or four cards, and a large reinforcer for completion of the entire contract.

On the third day, introduce the complete contract for each student. This may include as many as five to seven cards on each subject that the student is studying. Again, give small reinforcers for completion of three to five cards, and a large reinforcer for completion of the entire contract.

The Check List

The following check list is provided as an optional aid in initiating the system.

____ Decide how many students will participate.

____ Pre-test students, using standardized achievement tests.

____ Score tests and prepare a diagnostic profile card for each student.

____ Prepare a student folder for each student.

____ Place the diagnostic profile card in the student folder.

____ Using diagnostic profile cards, select materials and programs needed.

____ List programs each student will work on.

____ Prepare progress checks for programs.

____ Prepare progress sheet for each student.

____ Explain progress check system to students.

____ Introduce first program to all students.

____ Introduce remaining programs.

____ Introduce contingency contracts.

GLOSSARY OF TERMS

Behavioral Analysis - The process of arranging material to be learned into a series of sequential steps; usually moving the student from a familiar background into a new and complex set of concepts, principles, and understandings.

Behaviorism - System of psychology which strives to describe behavior and specify the conditions under which it is acquired, maintained, and eliminated.

Branching - A type of programing in which the student's responses are used to determine which subsequent frames he will be exposed to.

Constructed Response - A response that is composed by the student.

Contingency Management - A system of control which provides preferred events as consequences for learning.

Diagnostic Profile - Profile of strengths, deficiencies, and knowledge gaps based on achievement test performance of the student.

Extinction - The withholding of reinforcement. A behavior undergoing extinction soon decreases in frequency of occurrence. When this behavior ceases to occur, we speak of the behavior as being extinguished.

Feedback - Information as to the adequacy of a response. For the student this comes from the confirmation areas and from progress checks.

Frame - A discrete segment of a program which provides information and/or asks a question.

Gain Score - Score on post-test minus score on pre-test.

Group Method (Reasons for use) - In some cases it is necessary for students to proceed through a program at the same rate, but as a group rather than as individuals. This is necessary in the following conditions:

1) poor reading ability
2) review
3) scarcity of programs.

Linear Program - A program that has a single, predetermined sequence of steps for all students.

Pace - The rate at which the subject is permitted to work through the programed material. (The pace may be determined by the learner's ability or is fixed by group rates.)

Pre- and Post-tests - A supplemental progress check, or test, with questions relating to the whole course or to units.

Preferred Event - An experience or activity which the student may receive or engage in only after a desired task has been completed.

Preferred Programs - Any program that a student asks to go through is considered a preferred program. Spanish, Russian, and Hebrew have been highly preferred programs for many students.

Program - A scientifically prepared lesson presented in a permanent form.

Programing - The act of construction of the framed program from the behavioral analysis.

Progress Chart - Graphs that enable a student to plot and determine his progress.

Progress Check - Short test given to the student to determine the extent of his learning and retention.

Reinforcement - An event which acts to increase the probability or frequency of the behavior it follows.

Stimulus Control - When a behavior is emitted in the presence of a specific stimulus, we speak of the behavior being under stimulus control. A pigeon who pecks at a disk only when a red light comes on is under the stimulus control of the red light. When the child says, "Six," when presented with the equation 2 x 3, the response, "Six," is said to be under stimulus control.